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Exploratory Fishing of Bowie Seamount by the Automated Longliner *M/V Viking Star* August 28-September 12, 1980

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EXPLORATORY FISHING OF BOWIE SEAMOUNT BY THE AUTOMATED LONGLINER M/V VIKING STAR AUGUST 28-SEPTEMBER 12, 1980

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ABSTRACT

Carter, E. W., and B. M. Leaman. 1981. Exploratory fishing of Bowie Seamount by the automated longliner M/V VIKING STAR, August 28-September 12, 1980. Can. Data Rep. Fish. Aquat. Sci. 266: 30 p.

Bowie Seamount was explored using a vessel equipped with the Mustad autoline system. Rockfishes were the target species and were the dominant species in the catch. Sebastes aleutianus comprised 41% of the retained catch, followed by sablefish (Anoplopoma fimbria) with 11% and S. ruberrimus with 10%. The primary species discarded was halibut (69% of discard). Total retained catch was 6,819 kg while discards amounted to 2,404 kg. Catch rates at the Seamount during favourable weather were higher than at inshore localities.

Two days were spent fishing in the Langara Island area, due to inclement weather at the Seamount.

Biological characteristics of rockfishes at the Seamount suggest that they have undergone little, if any exploitation. The commercial and scientific importance of rockfish stocks on the Seamount is briefly discussed.

Key words: Bowie Seamount, exploratory fishing, rockfishes, longline.

RÉSUMÉ

Carter, E. W., and B. M. Leaman. 1981. Exploratory fishing of Bowie Seamount by the automated longliner M/V VIKING STAR, August 28-September 12, 1980. Can. Data Rep. Fish. Aquat. Sci. 266: 30 p.

Une pêche exploratoire a été pratiquée sur le Bowie Seamount à l'aide d'un bateau équipé du système de palangre automatique Mustad. Les scorpènes étaient les espèces visées et constituaient la plus grande partie des prises. Sebastes aleutianus composait 41 % des prises retenues, suivi de la morue charbonnière (Anaplopoma fimbria) et de S. ruberrimus avec respectivement 11 % et 10 %. La principale espèce rejetée était le flétan (69 % des rejets). Au total, 6 819 kg ont été retenus, tandis que 2 404 kg étaient rejetés. Les taux de prise sur le Seamount par temps favorable étaient supérieurs à ceux des zones côtières.

Pendant deux jours, le bateau a opéré dans la région de l'île Langara à cause du mauvais temps sur le Seamount.

Les caractéristiques biologiques des scorpènes sur le Seamount laissent croire qu'ils n'ont guère été exploités. L'importance commerciale et scientifique des stocks de scorpenes sur le Seamount est brièvement examinée.

Mots clés: Bowie Seamount, pêche exploratoire, scorpènes, palangre.

INTRODUCTION

Fishing for rockfishes at traditional fishing grounds in British Columbia waters has undergone substantial decreases in success in recent years. In part, these decreases have resulted from large removals by foreign vessels during the mid-1960s (Ketchen 1980). The Canadian fleet has had to explore new areas in order to maintain both income and production. An additional factor which the domestic industry must contend with is that permissible yields from rockfish stocks have had to be re-assessed in response to new knowledge of growth and mortality rates (Beamish 1979). Since instantaneous natural mortality rates are now estimated to be approximately one-half of previous values ($M \simeq 0.06$-0.10), estimates of sustainable yields are decreased concomitantly.

The foregoing have all contributed to an increased pressure to find new rockfish resources, particularly for red rockfishes, with their better market demand and keeping qualities. This report presents the results of the second exploratory cruise for rockfishes using automated longline gear. The first cruise (McCarter 1980) explored the west coast of the Queen Charlotte Islands in areas where substantial aggregations of rockfish were noted on trawl surveys, but in areas where trawling was impossible due to rough bottom. A similar situation had been noted in previous trawl trips to Bowie Seamount and the cruise reported here was initiated to assess the viability of longline fishing for rockfishes on the seamount.

This cruise was a joint project of the Groundfish and Fisheries Development Programs of Fisheries and Oceans, and the Fisheries Economic Development Program of the Marine Resources Branch, B.C. Ministry of Environment.

CRUISE PLAN

VESSEL AND GEAR

The M/V VIKING STAR is a 24.75 m seiner/autoliner built in 1978. The autoline house, measuring 6.7 m x 6.7 m x 3.0 m, is positioned on the stern and can be interchanged with the seine drum in approximately 1 h. The house contains 12-15 magazines, each consisting of 1400 hooks, gangions, and groundline coils which are suspended on racks. When setting gear, magazines are moved into a position where the groundline and hooks are drawn through an automatic cutting and baiting machine. Depending on the target species, the bait may vary from whole frozen herring and salmon to octopus, with herring being the most common. Bait is thawed in a tank and fed into the machine by a baiter. A second person assists the baiter ensuring that hooks are fed through properly. Hooks are sometimes set unbaited due to

misplacement of hooks on the magazine or improper placement of bait in the machine. The flags, buoys, buoy lines, and anchors are released by a third person on the roof of the house. Average setting time for one magazine (1,400 hooks) is about 10 min.

Gear is hauled at the starboard side and fish are gaffed and placed in a checker for subsequent sampling. Hooks pass through a series of rollers and brushes where old bait is removed and hooks cleaned. The line is then pulled through aluminum pipes along the port side to the house on the stern. A hook separator and twist remover in the house enables the hooks to be returned to the racks untangled and in order. One person monitors the line as it leaves the hook separator while one or two other people replace gangions and hooks which may be bent, broken, or need to be cut off due to tangles in the groundline. New gangions and hooks are tied to the groundline using a single overhand knot. Detailed vessel specifications are contained in Appendix Table 1 and gear characteristics included in Appendix Table 2.

FISHING LOCATION

Bowie Seamount is located approximately 175 km west of Rennell Sound, on the west coast of the Queen Charlotte Islands. The survey objective was to explore Bowie Seamount to determine the size and species composition of fish aggregations in the area. It was hoped that gear could be set at specific 55 m (30 fm) intervals in an attempt to sample all available depths. The entire survey was to be carried out at the seamount unless poor weather made fishing impossible. The Langara Island and Learmonth Bank areas were to be fished as an alternative.

Lack of an accurate chart of the seamount made it necessary to do a considerable amount of sounding to find suitable areas for gear to be set. It was noted that very sharp, narrow peaks existed in the shallower areas making it difficult to set without risking loss of gear. Poor weather and uneven topography hampered fishing in the first six days, allowing only 16 sets totalling 14,560 hooks to be made. Soak times ranged from 1.5-13 h with the average being about 4 h. Gear lost over the first six days included 17 lines, 2 anchors, and 183 m (100 fm) of buoy line.

High winds and rough seas forced a harbour day at Langara Island half way through the survey. Four sets were made the following day off Langara Island and after hauling, we returned to the seamount. Poor weather allowed only two sets to be made over the next two days, consequently much time was spent jogging into the weather and sounding the bottom. Fair weather greatly increased production over the last two days at the seamount. Ten sets were made and hauled including three overnight sets, with the average soak time of about 7.5 h.

The final day of the survey was spent in the Langara Island area where five sets were made. A total of approximately 33,460 hooks were set during the survey, while 29,960 hooks were successfully hauled. Gear loss totalled 25 lines, 2 anchors and 183 m (100 fm) of buoy line. Bridge log

data are included in Appendix Table 3 and set locations plotted on charts in Fig. 1-2. Set depths as plotted on the charts do not always coincide with the bridge log data due to differences in map scales.

BIOLOGICAL SAMPLING AND FISH PROCESSING

A minimum goal of one 200-length/sex/maturity/double otolith sample for each rockfish species was set. Only one complete sample (i.e. from one haul) was obtained on the rougheye rockfish (Sebastes aleutianus), which was by far the most abundant species on the seamount. Yelloweye rockfish (S. ruberrimus) was the only other rockfish for which over 100 specimens were collected. All other rockfish were caught in smaller numbers.

A sample of 128 length/sex/maturity/double otoliths of sablefish (Anoplopoma fimbria) was collected. Nearly 60% of the sablefish sampled were obtained in the Langara Island area. Biological sample data are contained in Appendix Tables 4-7 with a list of common and scientific names of all species encountered in Appendix Table 8.

Ideally, the rockfish would be dressed head-on for marketing, but removal of the otoliths made it necessary to dress most head-off. The crew was very cooperative in retaining the heads after dressing to allow a dressed-to-round conversion to be calculated for three species of rockfish. Rougheye rockfish were dressed head-on after 600 specimens had been collected. Sablefish were dressed head-off using a Japanese cut and a dressed-to-round conversion was also calculated for this species.

Dressed fish were washed and placed in plate freezers for 3-4 h and later transferred into bins. A summary of round weight and number of pieces by species is given in Table 1. Total catch and discard by pieces and haul is presented in Appendix Table 9.

Incidental species

Halibut (Hippoglossus stenolepis) was the most abundant incidental species with a total of 101 being caught. Undersized halibut were carefully measured and returned to the sea, alive. A total of 33 halibut were retained following the season opening. Fourteen lingcod (Ophiodon elongatus) were caught and retained while all other incidental species were discarded. A summary of discards by round weight and number of pieces is included in Table 1.

RESULTS

A total of 1,167 rougheye rockfish were caught, comprising approximately 41% of the total landing. This species was caught in almost all sets, with 97% being obtained at the seamount. The largest catches were found in depths between 141 and 592 m (77-324 fm). The calculated dressed-to-round conversions averaged 1.24.

Yelloweye rockfish was the next most abundant rockfish with 164 being caught, making up nearly 10% of the total landing. A higher percentage of this species (58%) came from the Langara Island area, in depths between 79 and 104 m (43-57 fm). The dressed-to-round conversions averaged 1.22.

Quillback rockfish (Sebastes maliger) was the only other retained rockfish, with 62 being caught. This species made up only 1% of the total landing and all were obtained in four sets off Langara Island, in the same depth range as the yelloweye rockfish. The calculated dressed-to-round conversion was 1.02.

All other rockfish were discarded and were, in order of abundance: the rosethorn rockfish (S. helvomaculatus), shortspine thornyhead (Sebastolobus alascanus), red-banded rockfish (Sebastes babcocki), silvergray rockfish (S. brevispinis), canary rockfish (S. pinniger), shortraker rockfish (S. borealis), bocaccio (S. paucispinis), and yellowmouth rockfish (S. reedi).

The state of maturity for male rockfish was found to be either resting or developed while females were found in a resting or maturing state. Length-frequency information has been compiled for the two major rockfish species and can be found in Appendix Table 7, with maturity information in Appendix Table 5.

Of the 128 sablefish sampled, 73 or 57% were from one set off Langara Island in a depth of 450-457 m (246-249 fm). From this set a head-off, dressed-to-round conversion of 1.66 was calculated. All other sets produced very few or no sablefish. The round weight of the species comprised 11% of the total landing. Both male and female sablefish were found to be in a maturing state. Length-frequency and maturity data are presented in Appendix Tables 7 and 6, respectively.

The all-species average catch rate during the survey was calculated to be 0.27 kg (0.59 lb)/hook. This figure was calculated using the weight per number of hooks set rather than hauled, thereby giving a lower catch rate. All sets were used in the calculation except set 15 which was a total gear loss. Catch rates were generally much lower at the seamount, averaging 0.18 kg (0.39 lb)/hook as compared to a catch rate of 0.55 kg (1.20 lb)/hook in the Langara Island area. Again, the lower average at the seamount is partly due to the excessive gear loss.

DISCUSSION

The rockfish populations of Bowie Seamount are of interest to both the commercial industry and the research community. The potential of these populations as alternate resource bases for operations by the domestic fleet is of increasing importance. The mean catch rate of 0.18 kg/hook at Bowie Seamount compares favourably with that of 0.16 kg/hook recorded during similar fishing off the west coast of the Queen Charlotte Islands, in 1979 (McCarter 1980). The catch of commercial species on individual hauls was in fact higher at Bowie Seamount than at inshore locations. There is therefore a potentially attractive commercial resource of rockfishes at the seamount, although further fishing activity will be needed to quantify it.

A limiting factor to successful fishing on Bowie Seamount may be the amount of gear damage encountered. While 95.5% of hooks were recovered successfully during the 1979 inshore cruise, only 85.5% of hooks returned during the present cruise. It should be noted however that the lack of a chart for the seamount area and poor weather were extenuating circumstances of the seamount fishing. Gear damage may thus have been more extensive than would be encountered with more experience.

Bowie Seamount and seamounts in general are of considerable scientific interest due to their isolation from both regular commercial fishing and centres of rockfish abundance. The distribution of rockfish larvae has only been studied extensively off Oregon and southern California (Ahlstrom 1965; Ahlstrom et al. 1978; Richardson and Laroche 1979). These studies have noted that rockfish larvae are only abundant in nearshore areas (<100 km offshore) and that their density decreases precipitously with distance from shore. The only exception to this generality concerns the area around seamounts, where rockfish larvae are more abundant. This localized distribution of larvae around seamounts suggests that there are isolated, self-sustaining populations at these localities, although initial colonization probably occurred from the nearshore. This feature of these populations makes them attractive for the study of natural dynamics and responses to exploitation.

The lack of commercial fishing on most seamount rockfish stocks is an aspect that will undoubtedly change in the near future. Bowie Seamount has escaped serious exploitation of rockfishes although some effort for halibut (Myhre, pers. comm.) and sablefish (Leaman et al. 1978) has been expended. Some species, such as S. aleutianus are commercially exploited in the nearshore area; the Bowie Seamount population may thus provide a reference population for environmentally-induced dynamics of such species. While the seamount will undoubtedly have some unique environmental characteristics, the inherently conservative nature of rockfish biology (low mortality, slow growth) should lend some consistency to population responses over large areas.

This cruise was a preliminary investigation of Bowie Seamount; however, the biological data collected do attest to the relatively unexploited state of rockfish stocks in this area. Such stocks are normally evidenced by an accumulation of older, larger fish, with a high proportion

of those fish being females. Appendix Table 9 shows the mean size (51.5 cm) and sex ratio (49.6% female) of S. aleutianus at Bowie Seamount. Data from the commercial fishery for this species off the west coast of the Queen Charlotte Islands during 1978 and 1979 show mean sizes (45.3 cm, 46.9 cm) and sex ratio (42.4%, 38.4% females), respectively, which were considerably below those at the seamount. In addition, the size range of this species at the seamount (34-85 cm) was substantially broader than that of the inshore samples (36-59 cm). Age determination of all samples should provide further insights into the structure of the seamount and inshore stocks. The inshore samples have been aged and show decreasing frequency modes at 30, 40, 50, and 60 yr of age, and a range from 17-98 yr. The extended size distribution of the Bowie Seamount samples suggests that the age distribution may also be more extensive than inshore stocks.

Future research on Bowie Seamount will concentrate on assessment of stocks, determination of biological parameters for various species plus a long-term examination of rockfish dynamics and responses to exploitation.

ACKNOWLEDGMENTS

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Table 1. Summary of total catches and discards for M/V VIKING STAR Bowie Seamount cruise, August 28-September 12, 1980.

	Catch			Discard		
	Number of pieces	Round weight (kg)	Percent of total catch	Number of pieces	Round weight (kg)	Percent of total discard
Sebastes aleutianus	1,167	2,785.3	40.8	-	-	-
Hippoglossus stenolepis	33	2,275.7	33.4	68	1,666.1	69.3
Anoplopoma fimbria	128	742.8	10.9	-	-	-
S. ruberrimus	164	659.7	9.7	-	-	-
Ophiodon elongatus	14	230.8	3.4	-	-	-
S. maliger	62	84.9	1.2	-	-	-
S. borealis	3	27.1	0.4	-	-	-
S. pinniger	5	8.7	0.1	-	-	-
S. reedi	2	4.3	0.1	-	-	-
Squalus acanthias	-	-	-	*66	224.4	9.3
Sebastes babcocki	-	-	-	37	101.9	4.2
Raja rhina	-	-	-	11	90.1	3.8
Sebastolobus alascanus	-	-	-	60	52.4	2.2
Raja binoculata	-	-	-	3	49.1	2.0
Sebastes brevispinis	-	-	-	19	43.4	1.8
Atheresthes stomias	-	-	-	*8	37.9	1.6
S. helvomaculatus	-	-	-	70	37.7	1.6
Raja kincaidi	-	-	-	4	34.6	1.5
Gadus macrocephalus	-	-	-	9	22.9	1.0
Hydrolagus colliei	-	-	-	*19	22.4	0.9
Eopsetta jordani	-	-	-	7	11.1	0 5
S. paucispinis	-	-	-	1	5.6	0.2
Lepidopsetta bilineata	-	-	-	3	3.0	0.1
Hexagrammos decagrammus	-	-	-	1	1.0	-
Anarrhichthys ocellatus	-	-	-	1	not weighed	-
Total	1,578	6,819.3	100.0	387	2,403.6	100.0

*Count of species not taken before discarding.

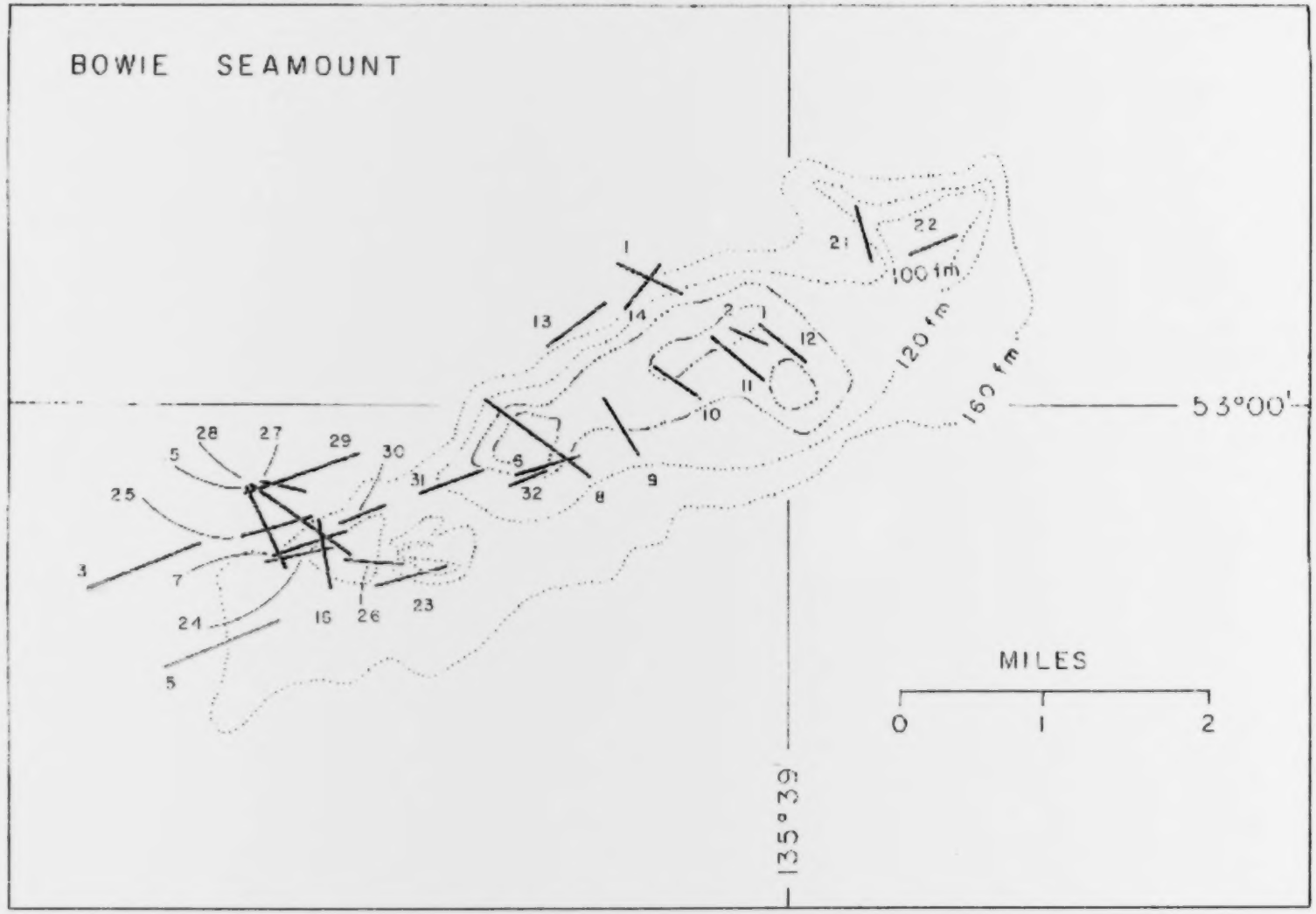

Fig. 1. Set locations of M/V VIKING STAR on BOWIE SEAMOUNT, August 28-September 12, 1980.

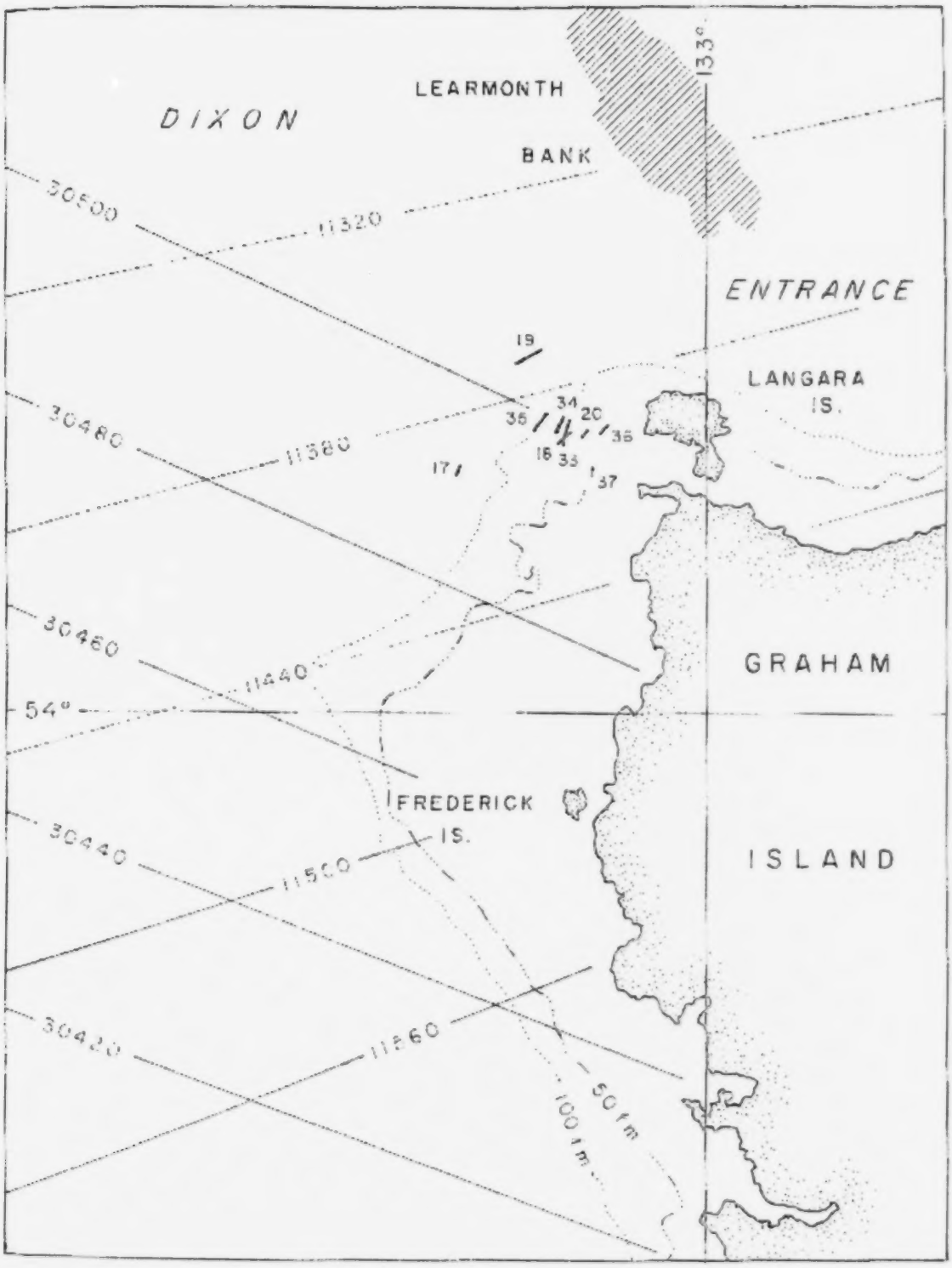

Fig. 2. Set locations of M/V VIKING STAR near Langara Is., August 28-September 12, 1980.

Appendix Table 1. Vessel specifications.

Name: VIKING STAR	Length: 24.75 m		Beam: 7 m		Draft: 3 m
Gear: Longline	Gross tonnage: 126.27 t			Net tonnage: 50.91 t	
Engine type: Diesel	Engine make: Caterpillar			Horsepower: 520	
Speed (maximum): 11 kn		Cruise: 10 kn			
Navigational devices:	Radar--Koden and Furuno Loran C--Koden and Northstar				
Fish finding devices:	Chromascope fish finder (Koden) Ekolite sounder Wesmar Sonar				
Fish holding capacity: 142 m^3					
Skipper: Egil Elvan/Emil Sletten					
No. of crew members: 6					
Year built: 1978					

Appendix Table 2. Gear characteristics, M/V VIKING STAR, August 28-September 12, 1980.

Longline dimensions

Skate length: 145 m

Gangion spacing: 1 m

Length of gangion: 38 cm

Gangion - 2 strand nylon, approximately 2 mm in diameter

Groundline - 3 strand terylene (tarred, split fibre for rigidity) approximately 6-7 mm in diameter.

Average number of lines/set: 5 or 10

Average set length: .75 or 1.5 km

Breaking strength of groundline: 800 kg

Average number of hooks/line: 140

Hook size: No. 6 Mustad

Appendix Table 3. Bridge log data--M/V VIKING STAR, August 28-September 12, 1980.

Set no.	Date 1980	Area	Set time		Depth (m)[a]		Haul time	Loran C[a] Start position		Loran C[a] Finish position		No. of lines	
			Start	Finish	Start	Finish	Start	X	Y	X	Y	Set	Lost
	Aug												
1	31	Bowie Seamount	0710	0715	46	229	0940	30319.5	11541.6	30319.6	11540.1	5	
2	31	Bowie Seamount	0810	0807	165	177	1335	30319.0	11544.2	30319.1	11543.2	5	
3	31	Bowie Seamount	1123	1130	293	594	1657	30312.4	11544.9	30313.6	11544.6	10	
4	31	Bowie Seamount	1443	1455	112	88	1935	Readings not recorded				10	
5	31	Bowie Seamount	1730	1745	466	304	2050	30311.5	11548.2	30312.7	11547.9	10	9.5
	Sept												
6	1	Bowie Seamount	0848	0853	221	210	1100	30316.5	11545.7	30315.9	11545.8	5	
7	1	Bowie Seamount	1207	1212	251	238	1515	30313.7	11545.7	30314.4	11545.7	5	
8	2	Bowie Seamount	1630	1643	251	198	1920	30316.3	11546.4	30317.0	11543.0	10	
9	2/3	Bowie Seamount	2025	2030	274	216	0945	30316.9	11546.1	30317.5	11544.2	5	
10	3	Bowie Seamount	0850	0857	234	203	1200	30317.9	11545.3	30318.2	11543.8	5	
11	3	Bowie Seamount	0822	0827	205	188	1252	30318.4	11545.4	30318.9	11543.4	5	
12	3	Bowie Seamount	0845	0848	188	154	1420	30318.9	11545.2	30319.3	11543.5	5	
13	3	Bowie Seamount	1127	1132	93	91	1543	30318.1	11541.8	03019.0	11541.1	5	
14	3	Bowie Seamount	1520	1525	88	86	1702	30319.8	11540.6	30319.0	11541.5	5	
15	4	Bowie Seamount	1141	1147	278	71	1520	30314.6	11543.5	30313.7	11546.0	7	1
16	4	Bowie Seamount	1200	1206	113	234	1648	30313.4	11547.5	30314.6	11544.7	7	
17	6	Langara Island	0732	0737	93	91	1126	30489.6	11401.9	30490.8	11399.3	5	
18	6	Langara Island	0755	0800	128	132	1025	30497.5	11401.7	30498.4	11399.6	5	
19	6	Langara Island	0836	0847	457	450	1425	30502.6	11374.2	30504.7	11373.5	15	
20	6	Langara Island	1155	1200	79	91	1535	30500.0	11402.2	30501.0	11400.0	5	

Appendix Table 3 (cont'd)

Set no.	Date 1980	Area	Set time		Depth (m)[a]		Haul time	Loran C					
								Start position		Finish position		No. of lines	
			Start	Finish	Start	Finish	Start	X	Y	X	Y	Set	Lost
	Sept												
21	7	Bowie Seamount	0935	0939	241	214	1525	30321.5	11540.8	30320.7	11542.8	5	
22	7	Bowie Seamount	1454	1459	221	230	1905	30321.0	11542.8	30321.5	11542.7	5	
33	9	Bowie Seamount	0830	0835	315	274	1106	30313.7	11547.6	30314.2	11547.9	5	
24	9	Bowie Seamount	0853	0858	263	241	1417	30313.6	11545.8	30314.1	11546.0	5	
25	9	Bowie Seamount	0917	0922	324	243	1657	30313.8	11545.0	30314.3	11545.1	5	
26	9/10	Bowie Seamount	1332	1336	280	249	0900	30314.1	11547.4	30314.0	11546.6	5	
27	9/10	Bowie Seamount	1457	1502	249	300	1813	30314.8	11543.3	30314.8	11544.1	5	
28	10	Bowie Seamount	1656	1701	232	252	0756	30314.7	11543.3	30314.0	11546.7	5	
29	10	Bowie Seamount	1916	1928	260	141	1156	30314.6	11543.4	30315.7	11543.3	10	
30	10	Bowie Seamount	1108	1112	234	238	1515	30314.9	11545.4	30314.5	11545.4	5	3
31	11	Bowie Seamount	1128	1133	227	245	1611	30315.2	11545.5	30315.8	11545.4	5	1
32	11	Bowie Seamount	1410	1415	220	232	1750	30315.8	11545.9	30316.2	11545.7	5	4
33	11	W. Langara Is.	0813	0823	154	123	1535	30499.9	11395.5	30498.0	11400.4	10	
34	11	W. Langara Is.	0834	0844	165	154	1813	30500.0	11394.2	30497.9	11398.4	10	
35	11	W. Langara Is.	0856	0904	188	176	1930	30499.6	11391.4	30497.7	11395.3	10	
36	11	W. Langara Is.	0922	0927	104	101	1430	30499.8	11399.4	30499.0	11401.3	5	
37	11	W. Langara Is.	0940	0944	91	79	1325	30496.5	11411.8	30495.6	11414.3	5	

[a]Depth in fn available in Fig. 1-2.

Appendix Table 4. Biological samples taken during the M/V VIKING STAR Bowie Seamount cruise, August 28-September 12, 1980.

Species	Length only	Length-sex maturity-oto2	Length-sex maturity	Total sampled
Sebastes aleutianus		634	533	1,167
S. ruberrimus		164		164
S. helvomaculatus		70		70
S. maliger		62		62
Sebastolobus alascanus		60		60
Sebastes babcocki		37		37
S. brevispinis		19		19
S. pinniger		5		5
S. borealis		3		3
S. reedi		2		2
S. paucispinis		1		1
Halibut	100			100
Sablefish		128		128
Total	100	1,185	533	1,818

Appendix Table 5. Summary of maturities of major rockfish species collected during M/V VIKING STAR Bowie Seamount cruise, August 28 - September 12, 1980.

SPECIES: S. aleutianus

LOCALITY: BOWIE SEAMOUNT

DATE: AUG. 28 - SEPT. 12, 1980

HAUL: 3, 29, 31 COMBINED

DEPTH (m). 141 - 594 RANGE

	MALE								FEMALE						
CONDITION[a]	1	9	8	8A	8B	8C	8D	8E	1	2	3	4	5	6	7
LENGTH (cm)															
34	-			-		-	-	-	1	-					-
35	-			-		-	-	-	-	-					-
36	-			-		-	-	-	-	-					-
37	-			-		-	-	-	2	-					-
38	-			-		-	-	-	2	-					-
39	1			-		-	-	-	-	-					-
40	-			-		-	-	-	1	-					-
41	1			-		-	-	1	-	-					-
42	4			-		-	1	-	2	-					-
43	1			-		-	-	1	1	2					1
44	1			1		-	1	2	1	1					1
45	4			1		-	-	7	1	3					6
46	1			2		-	1	9	4	6					7
47	1			4		-	1	5	1	3					13
48	1			1		1	5	18	-	4					11
49	-			-		-	3	14	2	5					4
50	-			2		-	5	7	-	4					6
51	-			1		-	3	10	-	3					3
52	-			-		-	4	6	-	4					5
53	-			-		-	-	9	-	6					3
54	-			-		-	5	6	-	4					5
55	-			-		-	1	6	-	7					1
56	-			-		-	4	2	-	3					3
57	-			-		-	3	4	-	4					4
58	-			-		-	2	1	-	2					1
59	-			-		-	2	1	-	1					-
60	-			-		-	1	-	-	1					1
SUB TOTAL	15			12		1	42	109	18	65					77
% MATURITY															
TOTAL															
SEX RATIO															

Appendix Table 5 (cont'd)
SPECIES: S. aleutianus
LOCALITY: BOWIE SEAMOUNT
DATE: AUG. 28 - SEPT. 12, 1980
HAUL: 3, 29, 31 COMBINED
DEPTH (m): 141 - 594 RANGE

	MALE								FEMALE						
CONDITION[a]	1	9	8	8A	8B	8C	8D	8E	1	2	3	4	5	6	7
LENGTH (cm)															
61	-			-		-	-	-	-	-					2
62	-			-		-	-	1	-	2					2
63	-			-		-	2	1	-	3					2
64	-			-		-	1	-	-	-					-
65	-			-		-	-	-	-	3					-
66	-			-		-	-	-	-	-					1
67	-			-		-	3	-	-	-					1
68	-			-		-	-	-	-	2					-
69	-			-		-	-	-	-	-					1
70	-			-		-	-	1	-	1					-
71	-			-		-	-	1	-	1					-
72	-			-		-	-	-	-	1					1
73	-			-		-	-	-	-	-					-
74	-			-		-	-	-	-	-					1
75	-			-		-	-	-	-	-					1
76	-			-		-	-	-	-	1					-
77	-			-		-	-	-	-	-					-
78	-			-		-	-	-	-	-					-
79	-			-		-	-	1	-	-					-
80	-			-		-	-	-	-	-					-
81	-			-		-	-	-	-	-					-
82	-			-		-	-	-	-	-					-
83	-			-		-	-	-	-	-					-
84	-			-		-	-	-	-	1					-
PREVIOUS SUB TOTAL	15			12		1	42	109	18	65					77
SUB TOTAL	15			12		1	48	114	18	80					89
% MATURITY	7.9			6.3		0.5	25.3	60.0	9.6	42.8					47.6
TOTAL	190								187						
SEX RATIO	50.4								49.6						

Appendix Table 5 (cont'd)
SPECIES: S. ruberrimus
LOCALITY: BOWIE SEAMOUNT & WEST LANGARA ISLAND
DATE: AUG. 28 - SEPT. 12, 1980
HAUL: TOTAL CATCH
DEPTH (m):

	MALE								FEMALE						
CONDITION[a]	1	9	8	8A	8B	8C	8D	8E	1	2	3	4	5	6	7
LENGTH (cm)															
38	1			1		-		-	-						-
39	1			-		-		-	-						-
40	-			-		-		-	1						1
41	3			-		-		-	-						-
42	2			-		-		-	-						-
43	-			1		-		-	2						2
44	-			-		-		-	-						2
45	2			1		-		-	-						-
46	-			1		-		-	-						-
47	1			3		-		-	-						2
48	1			-		-		-	-						3
49	-			2		-		-	-						4
50	-			1		-		1	-						-
51	2			2		-		-	-						6
52	-			3		-		-	-						8
53	-			3		-		1	-						3
54	-			3		-		1	-						3
55	-			-		-		-	-						6
56	-			2		-		-	-						7
57	-			7		2		-	-						3
58	-			6		1		1	-						2
59	-			3		-		1	-						1
60	-			6		-		-	-						
61	-			5		-		-	-						1
62	-			1		-		2	-						
63	-			-		-		-	-						
64	-			-		-		-	-						
SUB TOTAL	13			51		3		7	3						7
% MATURITY															

TOTAL

SEX RATIO

Appendix Table 5 (cont'd)
SPECIES: S. ruberrimus
LOCALITY: BOWIE SEAMOUNT & WEST LANGARA ISLAND
DATE: AUG. 28 - SEPT 12, 1980
HAUL: TOTAL CATCH
DEPTH (m):

	MALE								FEMALE						
CONDITION[a]	1	9	8	8A	8B	8C	8D	8E	1	2	3	4	5	6	7
LENGTH (cm)															
65	-			-		-		1	-						2
66	-			-		1		-	-						3
67	-			-		-		-	-						-
68	-			-		-		-	-						-
69	-			-		-		-	-						-
70	-			-		-		-	-						1
71	-			-		-		-	-						-
72	-			-		-		1	-						-
73	-			-		-		-	-						3
PREVIOUS SUB TOTAL	13			51		3		7	3						76
SUB TOTAL	13			51		4		9	3						85
% MATURITY	16.9			66.2		5.2		11.7	3.4						96.6
TOTAL	77								88						
SEX RATIO	46.7								53.3						

Footnote to Appendix Table 5

[a]Rockfish maturity codes.

Males
- 1 Immature (translucent, string-like testes)
- 9 Maturing (translucent-white, string-like testes)
- 8 Mature (small, brown to large white testes)
  - A - resting (small, brown, ribbon-like testes)
  - B - developing (swelling, brown-white testes)
  - C - developed (large, white testes; easily broken)
  - D - running sperm
  - E - spent

Females
- 1 Immature (translucent, small ovaries)
- 2 Maturing (small, yellow eggs; translucent or opaque)
- 3 Mature (large; yellow eggs; opaque)
- 4 Fertilized (large, orange-yellow eggs; translucent)
- 5 Embryos or larvae (includes eyed eggs)
- 6 Spent (large, flaccid, red ovaries)
- 7 Resting (moderate size, firm, red-gray ovaries)

Appendix Table 6. Summary of maturities of sablefish captured during the M/V VIKING STAR Bowie Seamount Cruise August 28 - September 12, 1980.

SPECIES: Anoplopoma fimbria

LOCALITY: BOWIE SEAMOUNT & WEST LANGARA ISLAND

DATE: AUG. 28 - SEPT. 12, 1980

HAUL: TOTAL CATCH

DEPTH (m):

	MALE								FEMALE						
CONDITION[b]	1	2	3	4	5	6	7		1	2	3	4	5	6	7
LENGTH (cm)															
51	-		-	-	-				1			-			-
52	-		-	-	-				-			-			-
53	-		-	-	-				-			-			-
54	1		-	-	-				-			-			-
55	-		-	-	-				-			-			-
56	-		-	1	-				-			-			-
57	-		-	2	-				-			-			-
58	-		-	3	-				-			-			-
59	-		-	3	-				-			1			-
60	-		1	5	-				-			1			-
61	1		-	5	1				-			-			-
62	-		-	7	1				-			-			-
63	-		-	4	1				-			-			-
64	-		-	6	-				-			2			-
65	-		-	4	-				-			1			-
66	-		-	2	-				-			-			-
67	-		-	5	-				-			-			-
68	-		-	5	-				-			1			-
69	-		-	6	-				-			3			-
70	-		-	4	-				-			-			-
71	-		-	6	-				-			6			1
72	-		-	2	-				-			3			-
73	-		-	1	-				-			4			-
74	-		-	-	-				-			3			1
75	-		-	-	-				-			2			-
76	-		-	-	-				-			2			-
77	-		-	2	-				-			2			-
SUB TOTAL	2		1	73	3				1			31			2
% MATURITY															
TOTAL															
SEX RATIO															

Appendix Table 6 (cont'd)
SPECIES: *Anoplopoma fimbria*
LOCALITY: BOWIE SEAMOUNT & LANGARA ISLAND
DATE: AUG. 28 - SEPT. 12, 1980
HAUL: TOTAL CATCH
DEPTH (m):

	MALE								FEMALE						
CONDITION[b]	1	2	3	4	5	6	7		1	2	3	4	5	6	7
LENGTH (cm)															
78	-		-	1	-				-			-			-
79	-		-	1	-				-			1			-
80	-		-	-	-				-			1			-
81	-		-	-	-				-			2			-
82	-		-	-	-				-			1			-
83	-		-	-	-				-			1			-
84	-		-	-	-				-			1			-
85	-		-	-	-				-			2			-
86	-		-	-	-				-			-			-
87	-		-	-	-				-			2			-
88	-		-	-	-				-			-			-
89	-		-	-	-				-			-			-
90	-		-	-	-				-			-			-
91	-		-	-	-				-			-			-
92	-		-	-	-				-			1			-
93	-		-	-	-				-			-			-
94	-		-	-	-				-			-			-
95	-		-	-	-				-			-			-
96	-		-	-	-				-			-			-
97	-		-	-	-				-			-			-
98	-		-	-	-				-			1			-
PREVIOUS SUB TOTAL	2		1	73	3				1			31			
SUB TOTAL	2		1	75	3				1			44			
% MATURITY	2.5		1.2	92.6	3.7				2.1			93.6			
TOTAL			81									47			
SEX RATIO			63.3									36.7			

Footnote to Appendix Table 6

[a]Sablefish maturity codes.

Males

1 Immature (translucent, string-like testes)
2 Maturing (translucent-white, small tests, some proportionally large convolutions)
3 Mature (whitening, testes large, convolutions firm)
4 Mature (white, testes large, convoluted)
5 Mature-Ripe (testes large, milt running white)
6 Mature-Spent (bloodshot, testes medium, convolutions flaccid)
7 Mature-Resting (translucent red or tan, testes small, convolutions firm)

Females

1 Immature (translucent, ovaries small)
2 Maturing (colouring, ovaries small)
3 Mature (opaque, creamy, ovaries large, blood vessels prominent)
4 Mature (creamy-yellow, ovaries large, eggs visible)
5 Mature-Ripe (ovaries large, eggs translucent)
6 Mature-Spent (bloodshot, ovaries medium, flaccid)
7 Mature-Resting (black or grey, ovaries small, firm)

Appendix Table 7. Size composition of major species encountered on the M/V VIKING STAR Bowie Seamount cruise, August 28-September 12, 1980.

Species	Rougheye rockfish *Sebastes aleutianus*		Yelloweye rockfish *S. ruberrimus*		Sablefish *Anoplopoma fimbria*	
Set no.	3, 29, 31		Total catch		Total catch	
	M	F	M	F	M	F
Length (cm)						
34	-	1	-	-	-	-
35	-	-	-	-	-	-
36	-	-	-	-	-	-
37	-	2	-	-	-	-
38	-	2	2	-	-	-
39	1	-	1	-	-	-
40	-	1	-	2	-	-
41	2	-	3	-	-	-
42	5	2	2	-	-	-
43	2	4	1	4	-	-
44	5	3	-	2	-	-
45	12	10	3	-	-	-
46	13	17	1	-	-	-
47	11	17	4	2	-	-
48	26	15	2	3	-	-
49	17	11	2	4	-	-
50	14	10	2	-	-	-
51	14	6	4	6	-	1
52	10	9	3	8	-	-
53	9	11	4	3	-	-
54	11	9	4	3	1	-
55	7	8	-	6	-	-
56	6	8	2	7	1	-
57	7	8	9	3	2	-
58	3	3	8	2	3	-
59	3	1	4	7	3	1
60	1	2	6	4	6	1
61	-	2	5	5	7	-
62	1	4	3	5	8	-
63	3	5	-	1	5	-
64	1	-	-	1	6	2
65	-	3	1	2	4	1
66	-	1	1	3	2	-
67	3	1	-	-	5	-
68	-	2	-	-	5	1
69	-	1	-	-	6	3
70	1	1	-	1	4	-
71	1	1	-	-	6	3
72	-	2	1	-	2	3
73	-	-	-	3	1	4
74	-	1	-	-	-	4
75	-	1	-	-	-	2

Appendix Table 7 (cont'd)

Species	Rougheye rockfish *Sebastes aleutianus*		Yelloweye rockfish *S. ruberrimus*		Sablefish *Anoplopoma fimbria*	
Set no.	3, 29, 31		Total catch		Total catch	
	M	F	M	F	M	F
Length (cm)						
76	-	1	-	-	-	2
77	-	-	-	-	2	2
78	-	-	-	-	1	-
79	1	-	-	-	1	1
80	-	-	-	-	-	1
81	-	-	-	-	-	2
82	-	-	-	-	-	1
83	-	-	-	-	-	1
84	-	1	-	-	-	1
85	-	-	-	-	-	2
86	-	-	-	-	-	-
87	-	-	-	-	-	2
88	-	-	-	-	-	-
89	-	-	-	-	-	-
90	-	-	-	-	-	-
91	-	-	-	-	-	-
92	-	-	-	-	-	1
93	-	-	-	-	-	-
94	-	-	-	-	-	-
95	-	-	-	-	-	-
96	-	-	-	-	-	-
97	-	-	-	-	-	-
98	-	-	-	-	-	1
Total	190	187	77	87	81	47
$\bar{x}$	51.46		54.79		68.52	

Appendix Table 8. List of common and scientific names of species encountered.

Common name	Scientific name
FLATFISH	
Halibut	Hippoglossus stenolepis
Rock sole	Lepidopsetta bilineata
Turbot	Atheresthes stomias
Petrale sole	Eopsetta jordani
ROCKFISH	
Rougheye rockfish	Sebastes aleutianus
Red-banded rockfish or convict	S. babcocki
Shortraker rockfish	S. borealis
Silvergray rockfish	S. brevispinis
Rosethorn rockfish	S. helvomaculatus
Quillback rockfish	S. maliger
Bocaccio	S. paucispinis
Canary rockfish	S. pinniger
Yellowmouth rockfish	S. reedi
Yelloweye rockfish	S. ruberrimus
Shortspine thornyhead or idiot	Sebastolobus alascanus
ROUNDFISH	
Sablefish	Anoplopoma fimbria
Lingcod	Ophiodon elongatus
Pacific cod	Gadus macrocephalus
Kelp greenling	Hexogrammos decagrammus
Wolf eel	Anarrhichthys ocellatus
CARTILAGINOUS FISH	
Dogfish	Squalus acanthias
Ratfish	Hydrolagus colliei
Longnose skate	Raja rhina
Big skate	Raja binoculata
Black skate	Raja kincaidi

Appendix Table 9. Summary of total catches and discards (pieces) by set for M/V VIKING STAR Bowie Seamount cruise, August 28-September 12, 1980.

	Bowie Seamount																				
Species/Set no.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	21	22	23	24	25
Sebastes aleutianus	3	3	126		1	63	24	87	35	70	6		3			20	83	16	10	87	62
S. ruberrimus	21	2		7								1	28								
S. helvomaculatus	2			10			2	2	2				19	4		1					
S. maliger																					
Sebastolobus alascanus			8																		1
Sebastes babcocki		1				1		6	2	9							2	3			
S. brevispinis										1											
S. pinniger																					
S. borealis			2																		
S. paucispinis																					
S. reedi										2											
Sablefish			10		1		4	2	3	1	1					7	1				3
Pacific cod																					
Lingcod																					
Kelp greenling																					
Rock sole																					
Petrale sole											1										
Halibut							1														
Turbot																					
Ratfish																					
Dogfish																					
Longnose skate												1									
Black skate																					
Big skate																					
Wolf eel																					
Total	26	6	146	17	2	64	32	97	42	83	8	2	50	4	-	28	86	19	10	87	66

Appendix Table 9 (cont'd)

Species/Set no.	Bowie Seamount							Sub-total	Langara Island									Sub-total
	26	27	28	29	30	31	32		17	18	19	20	33	34	35	36	37	
Sebastes aleutianus	41	24	34	146	57	105	25	1,132			35							1,167
S. ruberrimus						1		60	36			19	9			22	19	165
S. helvomaculatus	4	1	3	1	1		1	53	6			4	1			3	3	70
S. maliger								0	22			19				2	19	62
Sebastolobus alascanus								9			51							60
Sebastes babcocki	1		5		2	5		37										37
S. brevispinis								1		1			4	6	5		2	19
S. pinniger								0									5	5
S. borealis								2			1							3
S. paucispinis								0						1				1
S. reedi								2										2
Sablefish	3	1	5	5	8	3		55			73							128
Pacific cod								0		3			4	1	1			9
Lingcod								0				1	4		5	2	2	14
Kelp greenling								0	1									1
Rock sole								0				3						3
Petrale sole								1		2				2	1	1		7
Halibut	1	2						4	13	15	3	13	22	6	13	9	3	101
Turbot								0		4	*			2	2			8+
Ratfish								0	6	1		2				5	5	19
Dogfish								0	1	11	*	*	13	16	23	1	1	66+
Longnose skate		1	1					3		3	2		1		1			10
Black skate								0			3			1				4
Big skate								0						2			1	3
Wolf eel								0				1						1
Total	48	33	48	155	63	111	26	1,359	85	40	168	62	58	37	51	45	60	1,965

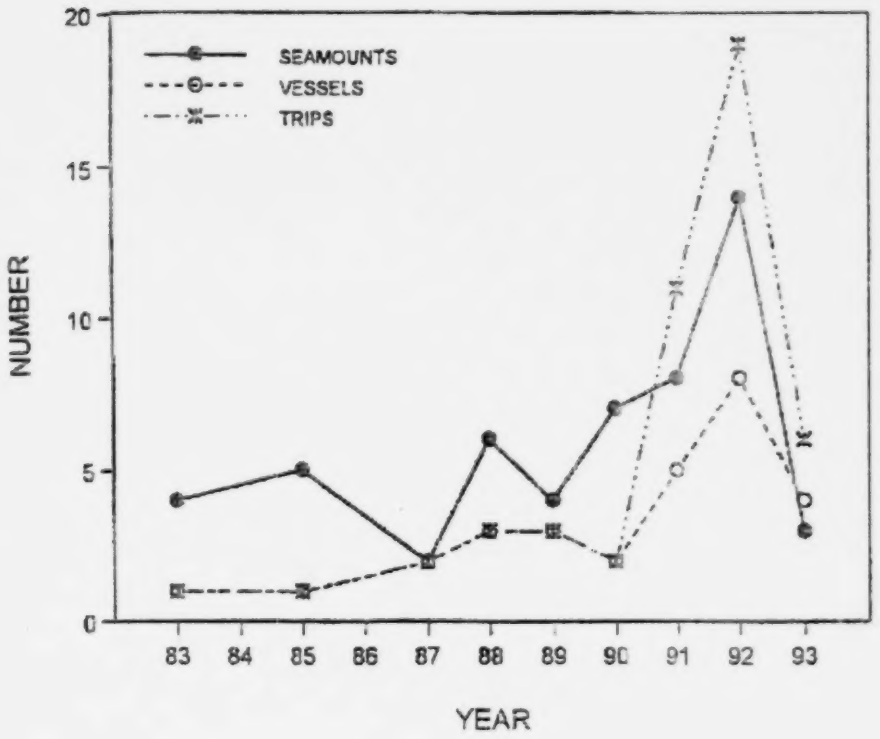

Figure 5. Annual number of seamounts fished, annual number of individual vessels involved in the seamount fishery, and number of annual trips to seamounts in the northeastern Pacific Ocean.

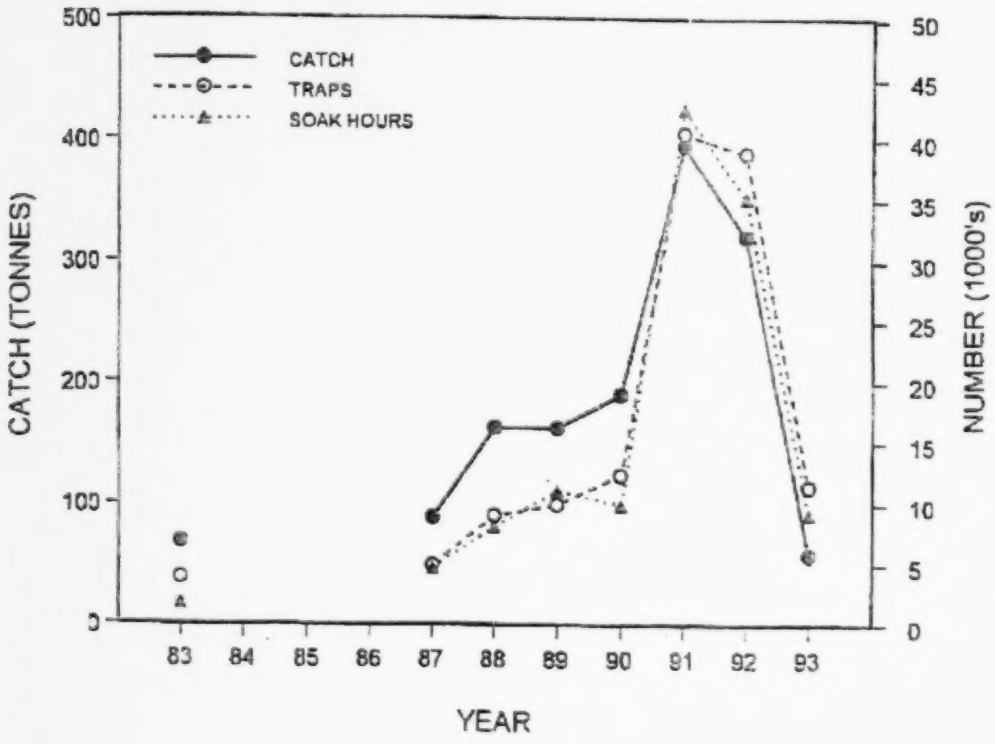

Figure 6. Annual catch of sablefish, annual number of traps deployed, and annual number of soak hours for the trap-fishery on northeastern Pacific Ocean seamounts.

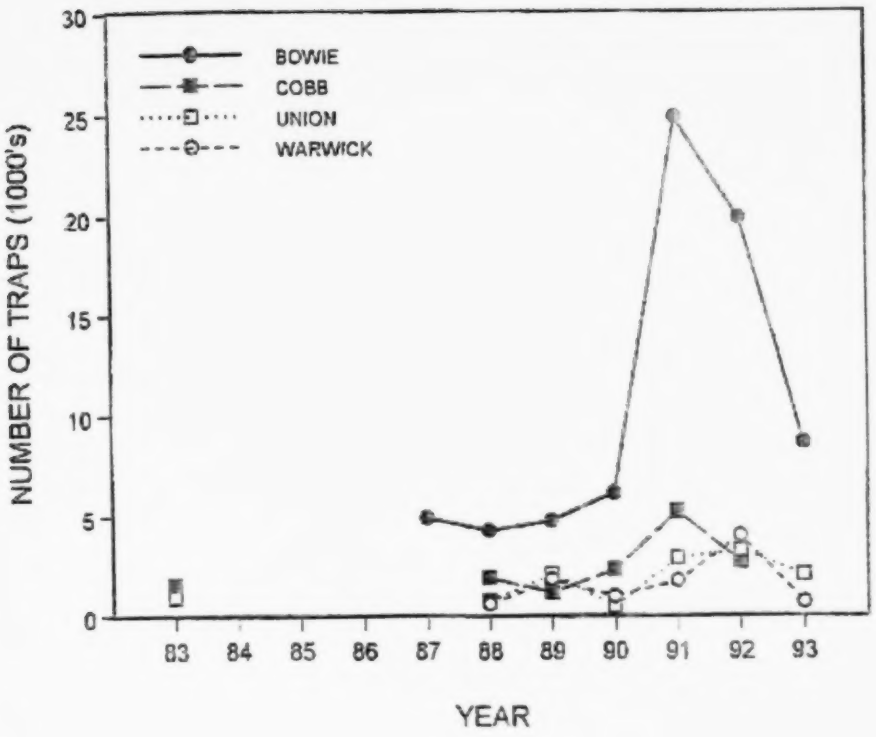

Figure 7. Total annual number of sablefish traps deployed on Bowie, Cobb, Union, and Warwick Seamounts, 1983-1993.

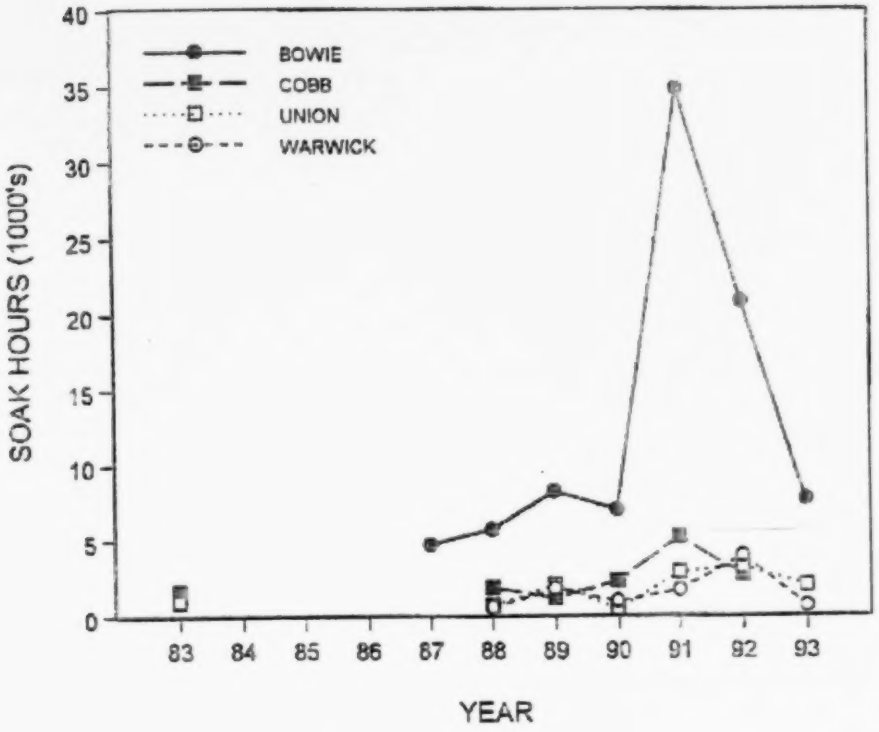

Figure 8. Total annual number of soak hours in the sablefish trap-fishery on Bowie, Cobb, Union, and Warwick Seamounts, 1983-1993.

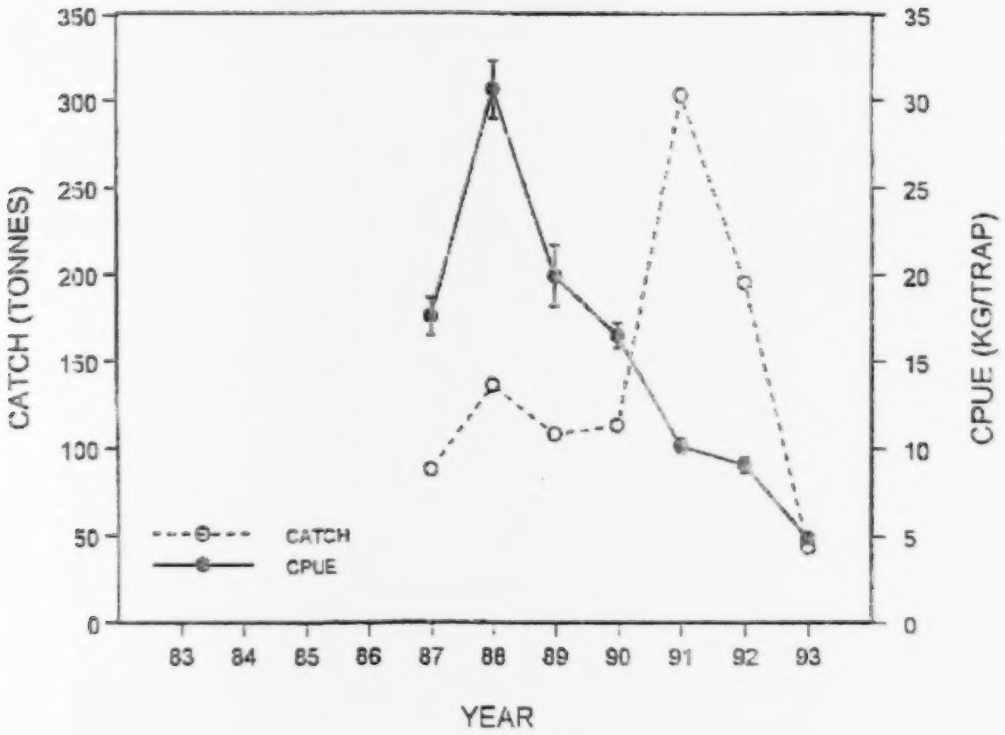

Figure 9. Annual mean catch and annual mean CPUE (±SE) for the sablefish trap-fishery on Bowie Seamount.

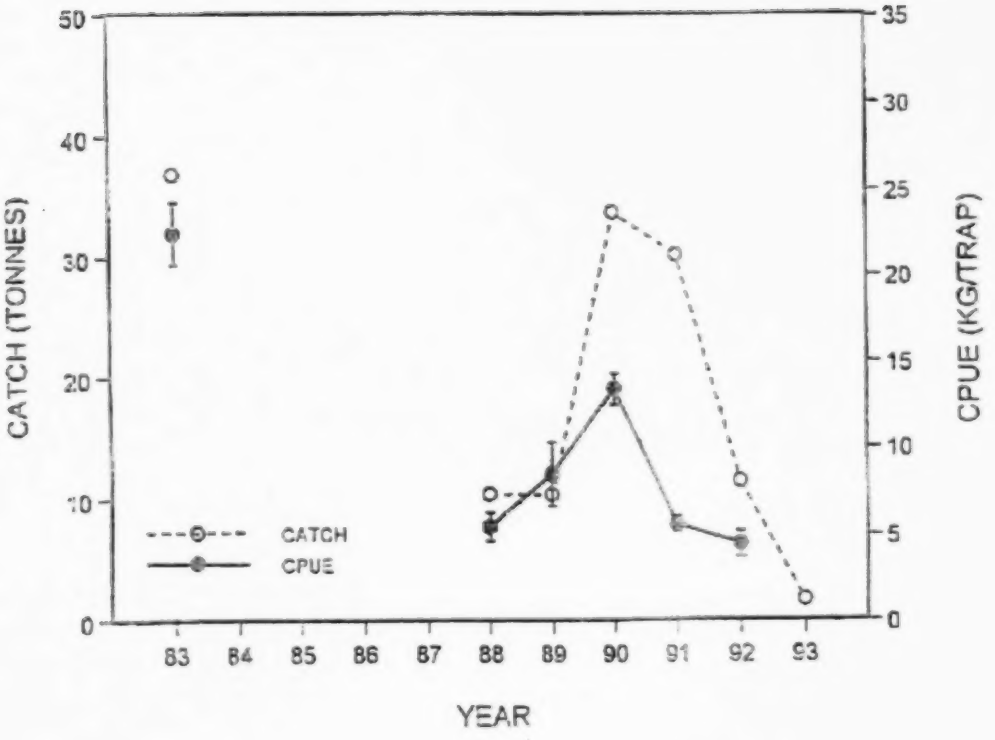

Figure 10. Annual mean catch and annual mean CPUE (±SE) for the sablefish trap-fishery on Cobb Seamount.

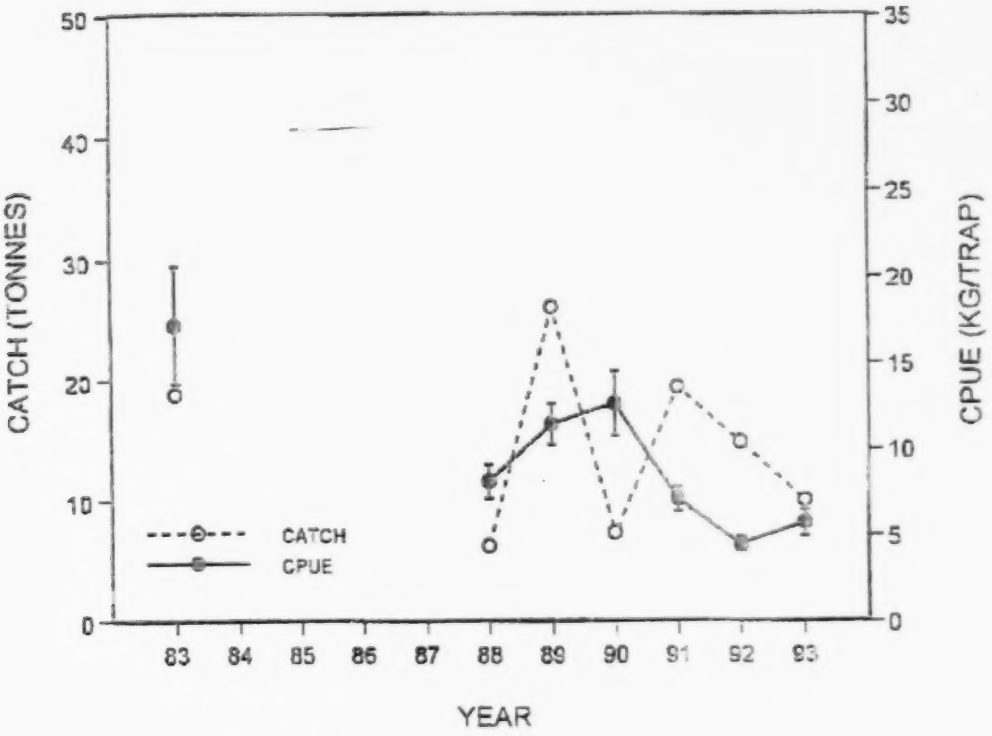

Figure 11. Annual mean catch and annual mean CPUE (±SE) for the sablefish trap-fishery on Union Seamount.

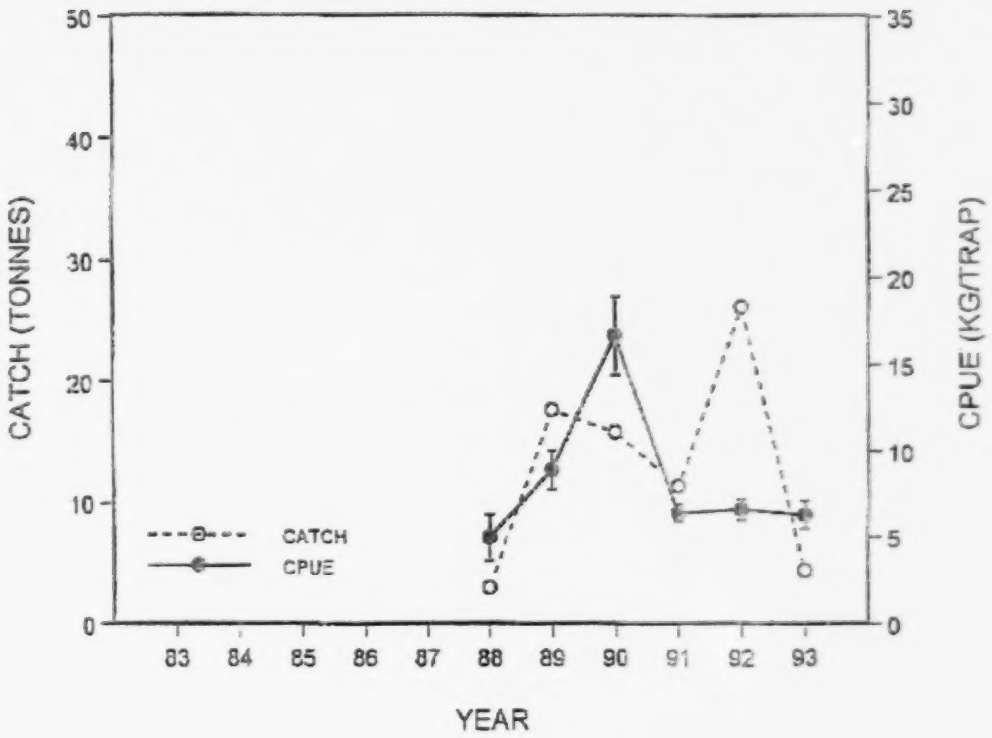

Figure 12. Annual mean catch and annual mean CPUE (±SE) for the sablefish trap-fishery on Warwick Seamount.

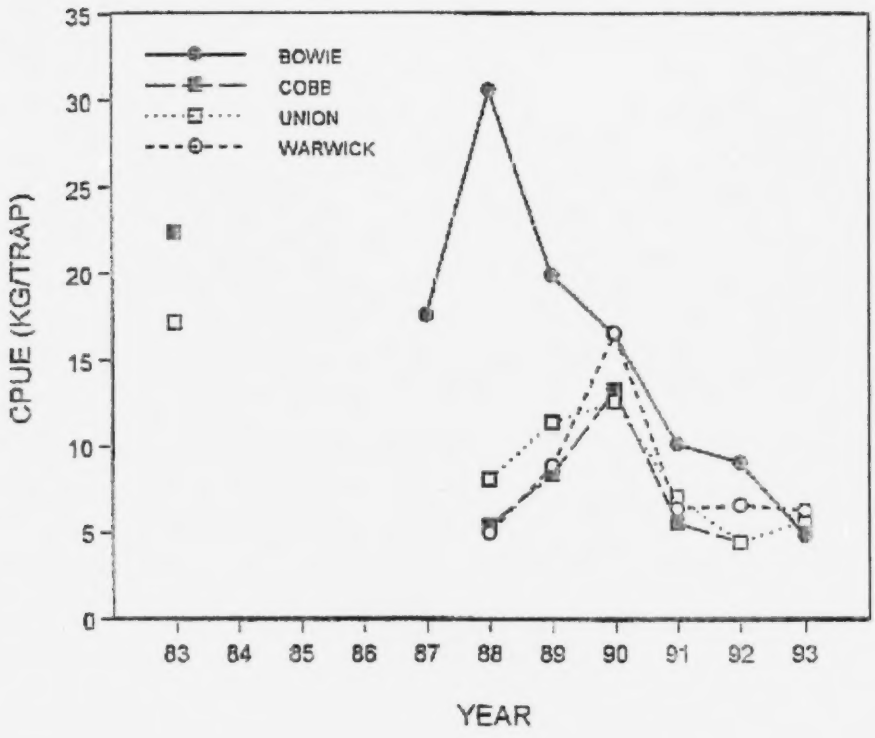

Figure 13. Annual mean CPUE for the sablefish trap-fishery on Bowie, Cobb, Union, and Warwick Seamounts, 1983-1993.

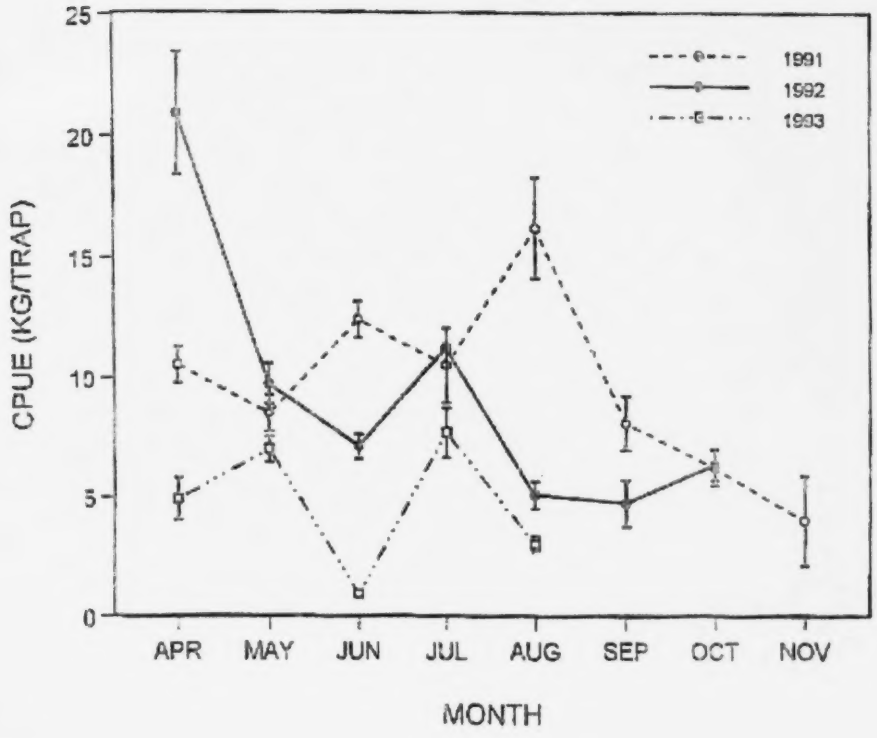

Figure 14. Monthly CPUE (±SE) in 1991, 1992, and 1993 for Bowie Seamount.

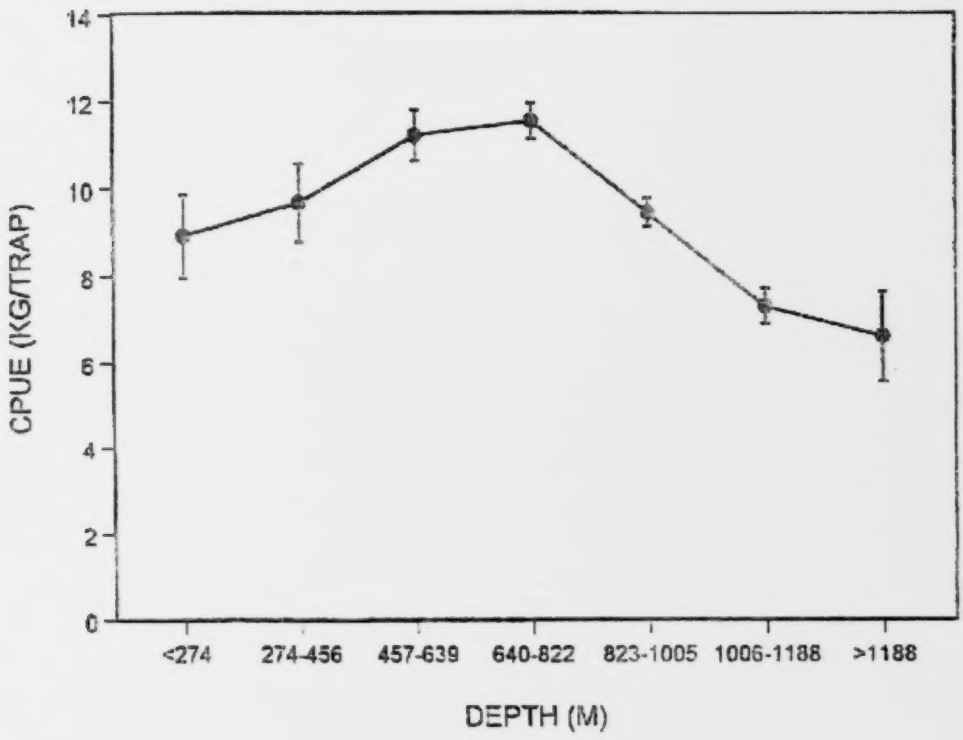

Figure 15. Mean CPUE (± SE) as a function of depth strata for all seamounts pooled.

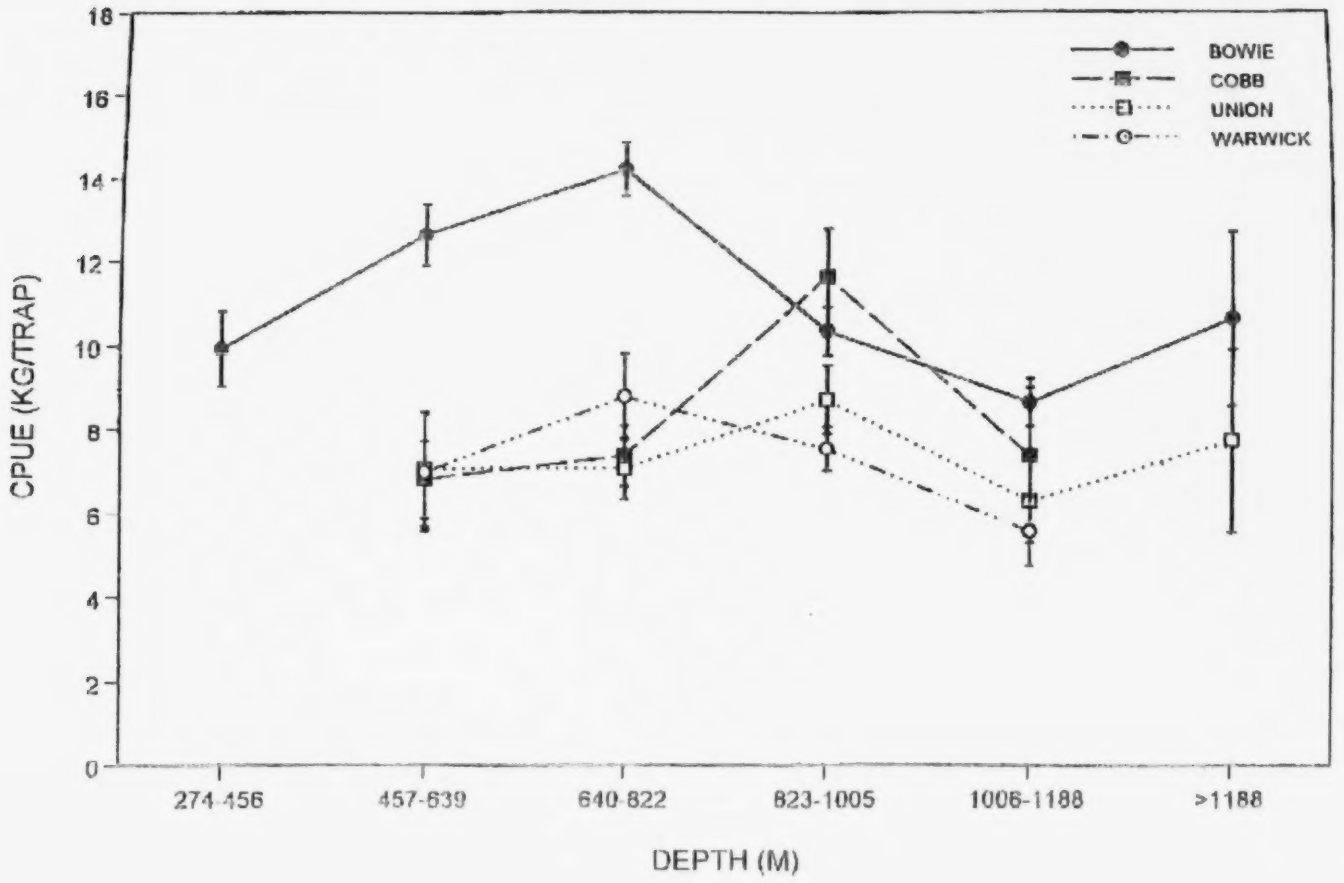

Figure 16. Mean CPUE (±SE) for the sablefish trap-fishery on Bowie, Cobb, Union and Warwick Seamounts as a function of depth strata.

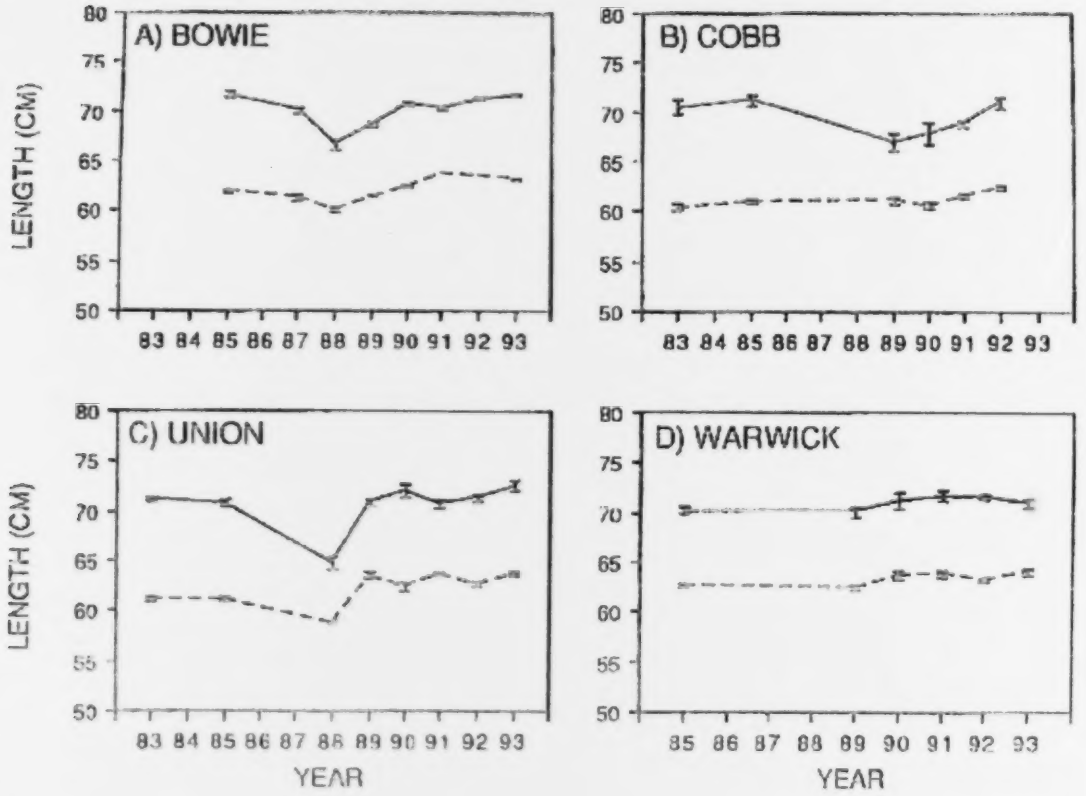

Figure 17. Annual mean fork lengths (± SE) for male (dashed) and female (solid) sablefish sampled from Bowie, Cobb, Union, and Warwick Seamounts, 1983-1993.

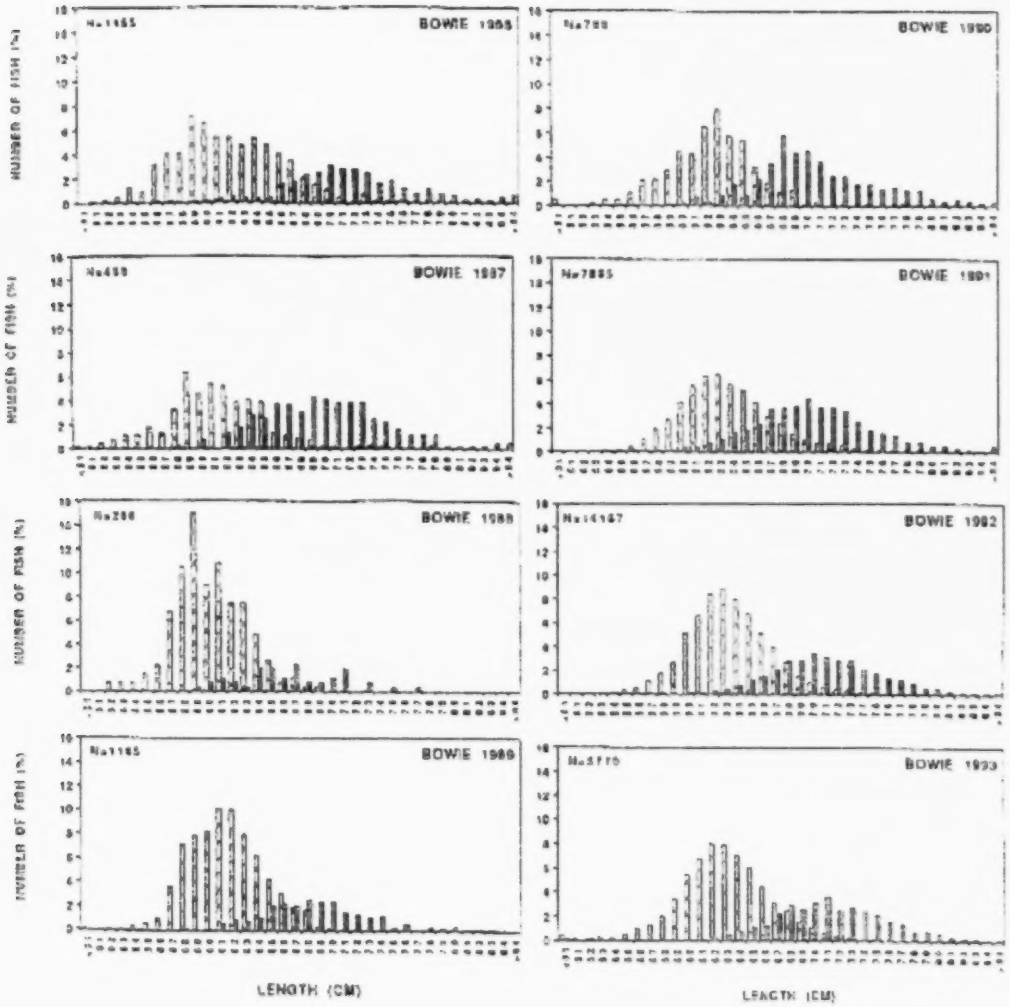

Figure 18. Length frequencies for sablefish sampled from Bowie Seamount, 1985-1993. Males are represented by hatched bars; females by solid bars.

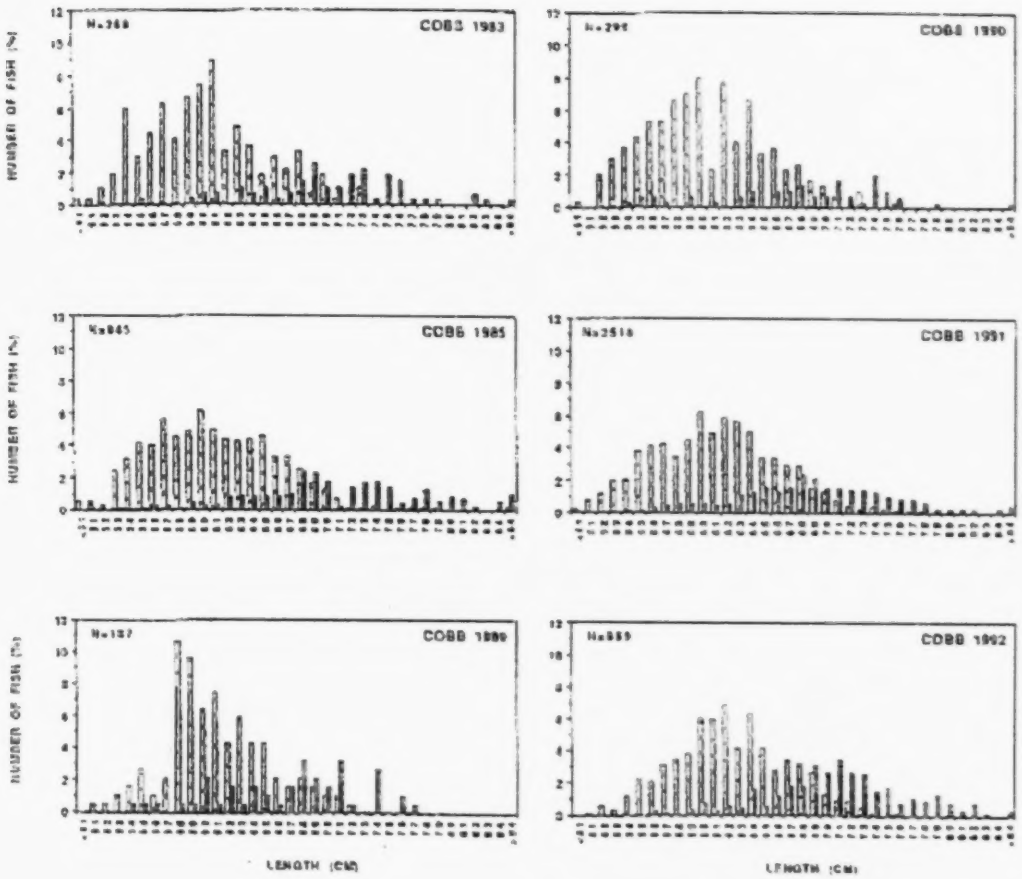

Figure 19. Length frequencies for sablefish sampled from Cobb Seamount, 1983-1992. Males are represented by hatched bars, females by solid bars.

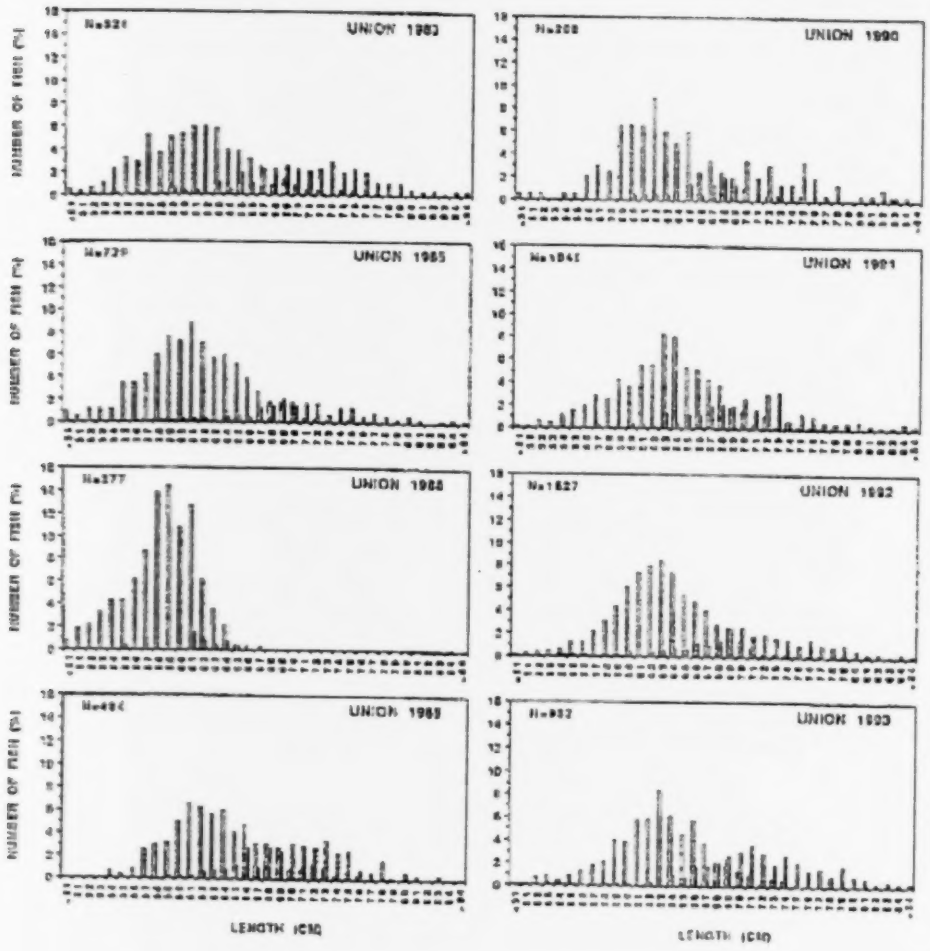

Figure 20. Length frequencies for sablefish sampled from Union Seamount, 1983-1993. Males are represented by hatched bars; females by solid bars.

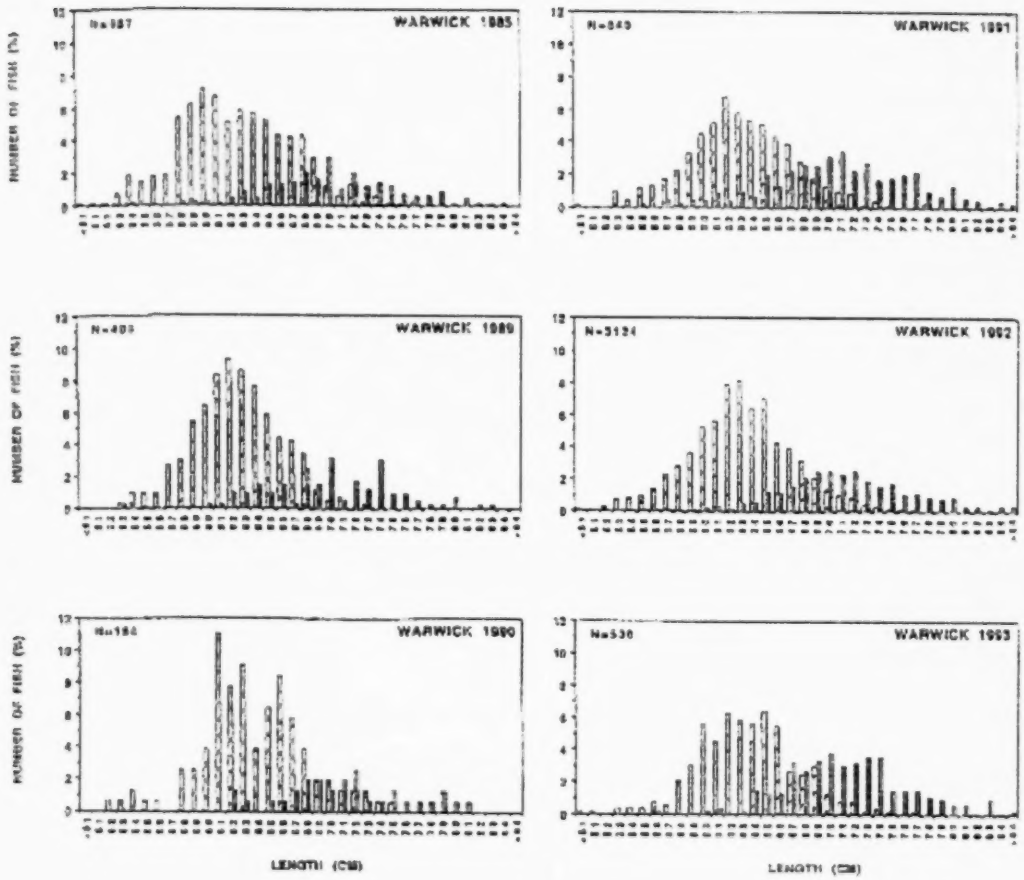

Figure 21. Length frequencies for sablefish sampled from Warwick Seamount, 1985-1993. Males are represented by hatched bars; females by solid bars.

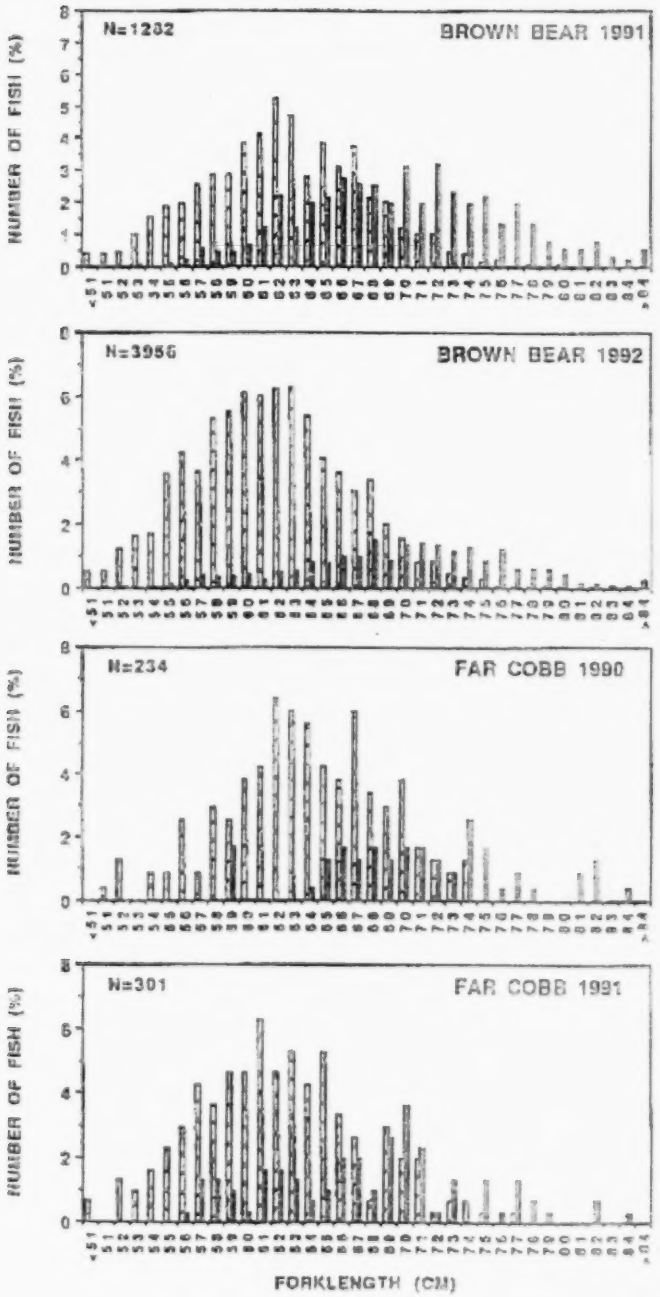

Figure 22. Length frequencies for sablefish sampled from Brown Bear and Far Cobb Seamounts. Males are represented by hatched bars; females by solic bars.

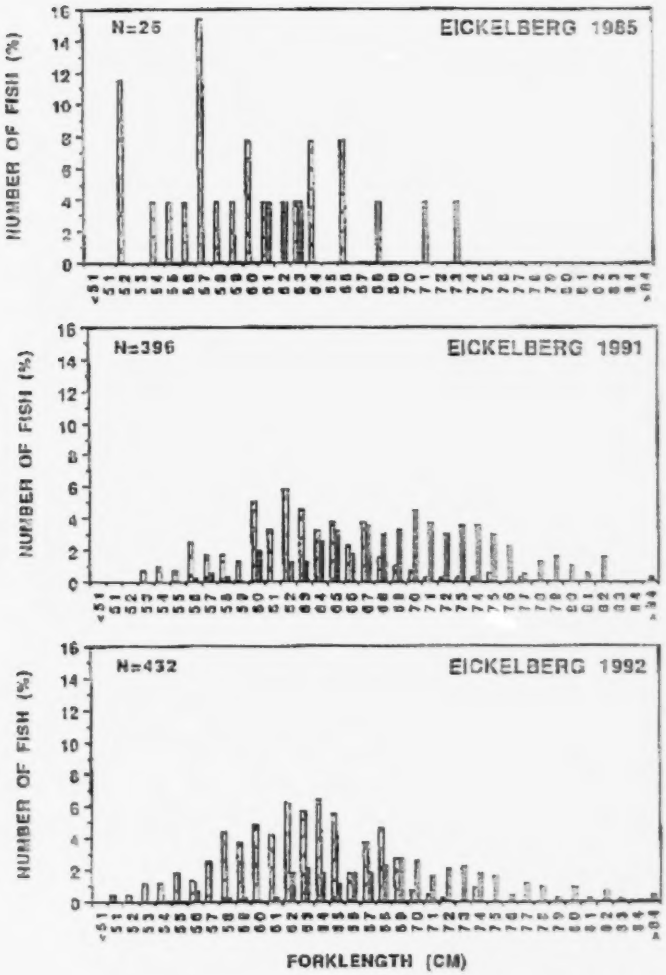

Figure 22 (Cont'd). Length frequencies for sablefish sampled from Eickelberg Seamount. Males are represented by hatched bars; females by solid bars.

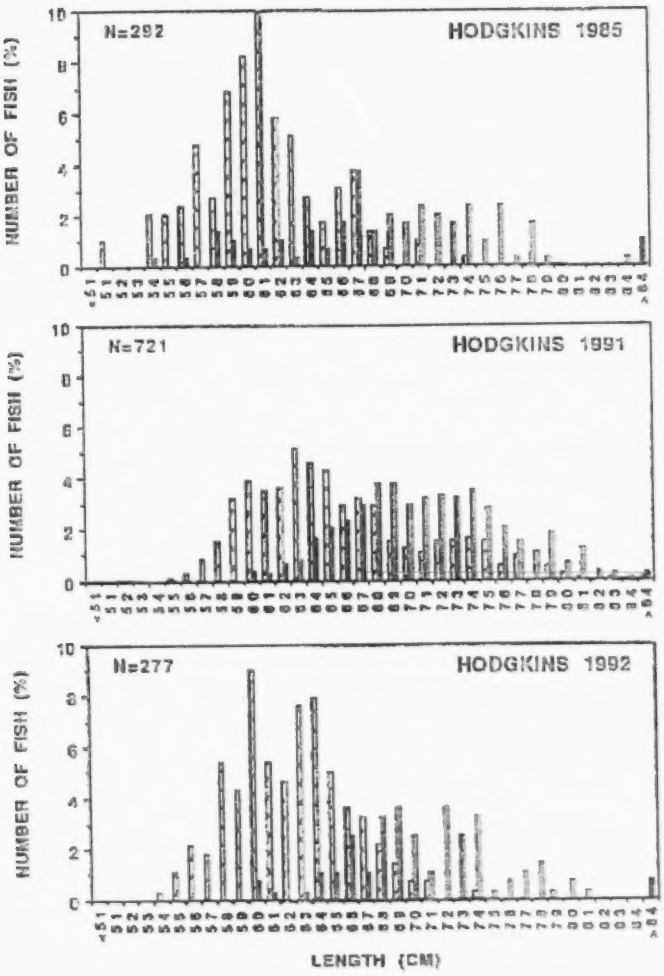

Figure 22 (Cont'd). Length frequencies for sablefish sampled from Hodgkins Seamount. Males are represented by hatched bars; females by solid bars.

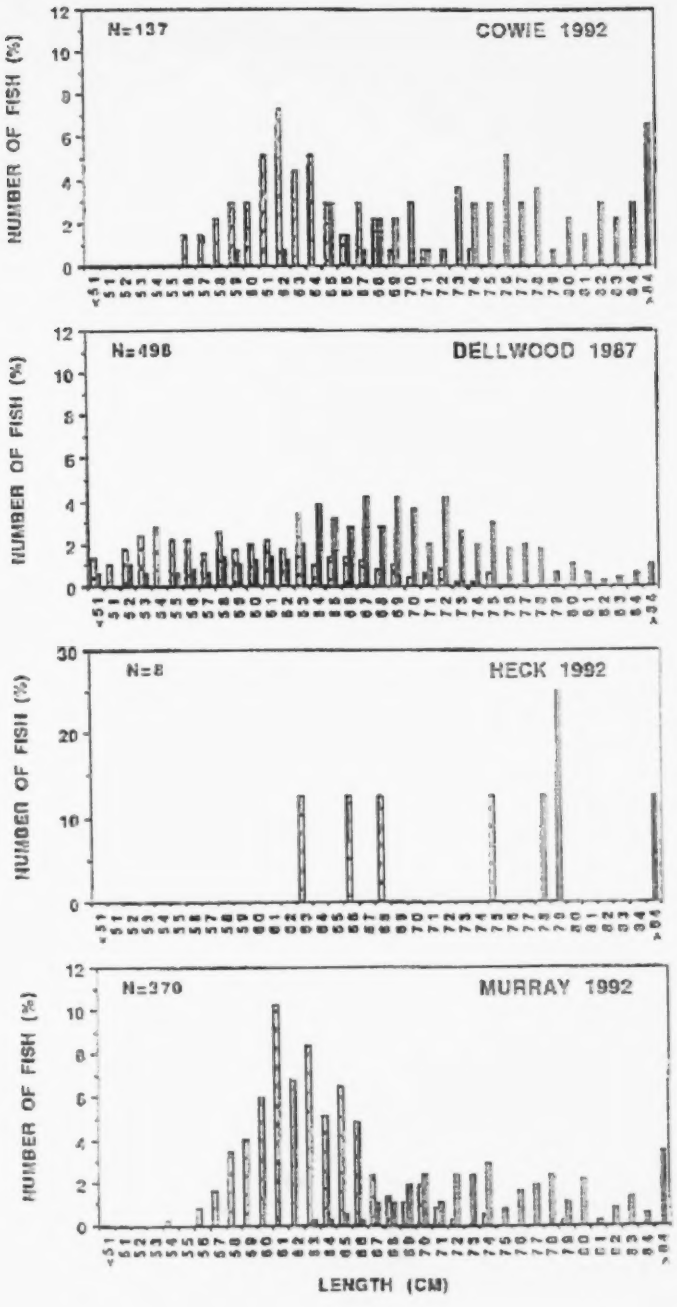

Figure 23. Length frequencies for sablefish sampled from minor seamounts. Males are represented by hatched bars; females by solid bars.

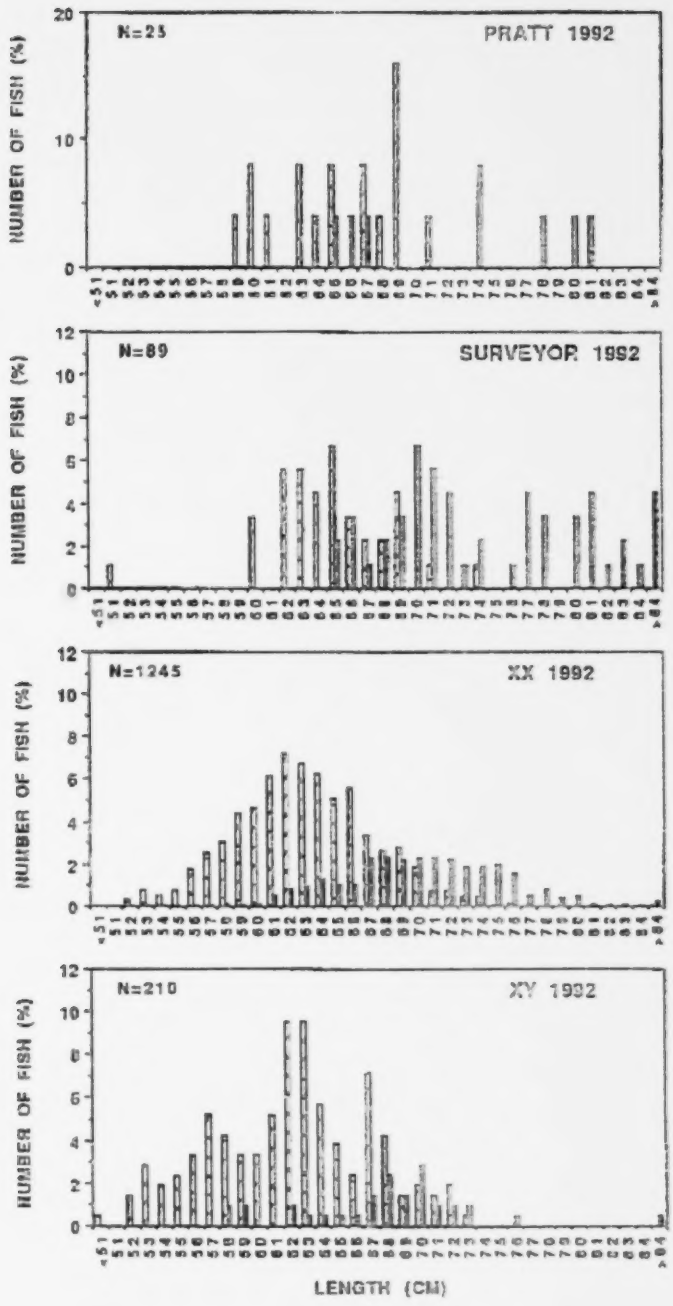

Figure 23 (Cont'd). Length frequencies for sablefish sampled from minor seamounts. Males are represented by hatched bars; females by solid bars.

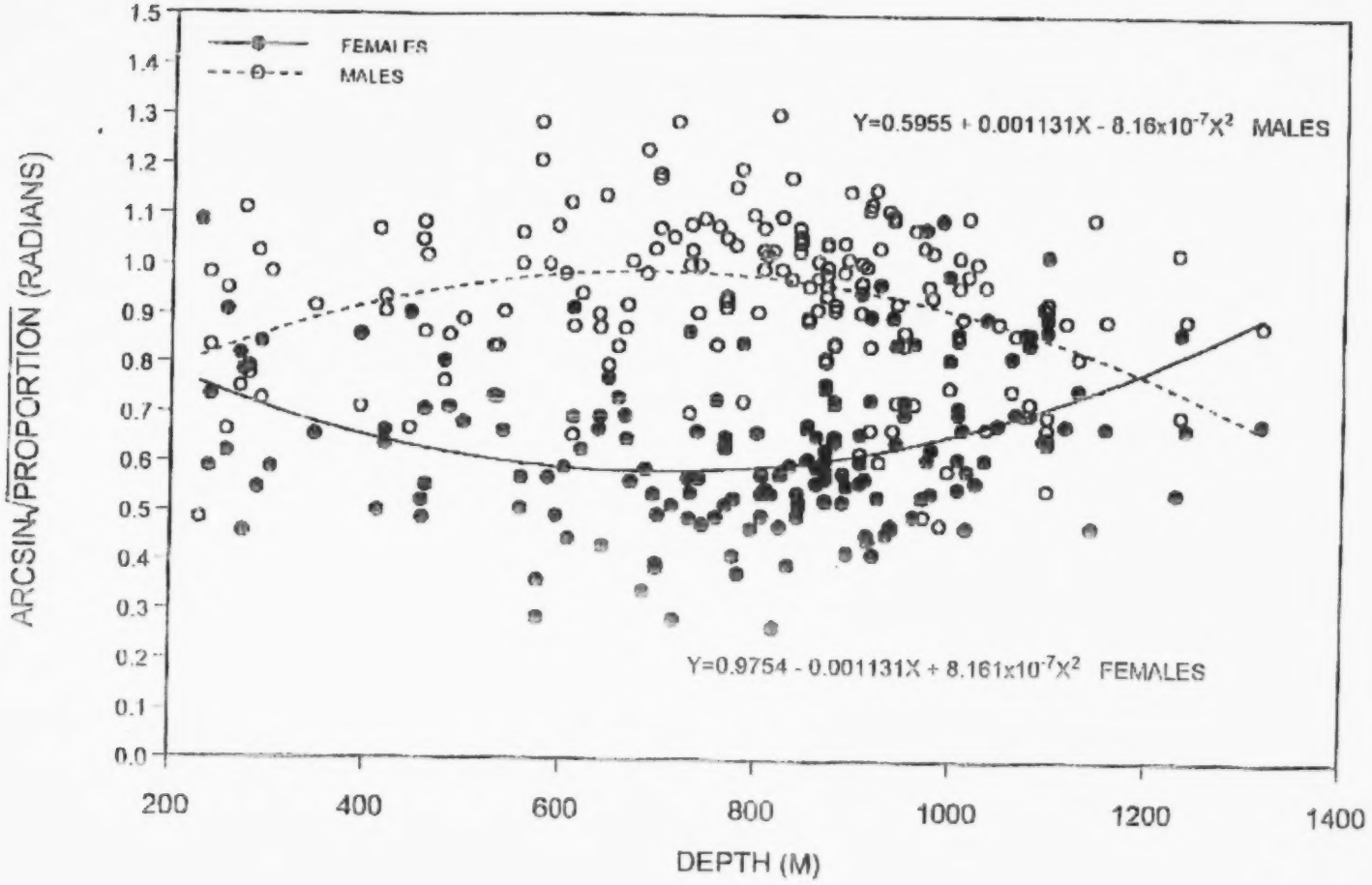

Figure 24. Proportion of male and female sablefish in individual fishing sets from Bowie Seamount in 1991-1993 as a function of depth.

Appendix Table 1. Summary of seamount fishing trips for sablefish using baited longlines (hooks), 1989-1993.

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE No.[b]	SEAMOUNT
1992	Apr 25-May 18	Nordic Spirit	S-NSP-1-6	92007	Bowie

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 2. Summary of seamount fishing trips for sablefish using trawls, 1989-1993.

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE No.[b]	SEAMOUNT
1988	Jun 15	Arctic Harvester	-	-	Warwick
1989	Oct 11	Eldorado	-	-	Warwick

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 3. Summary of directed fishing trips for yelloweye rockfish (*Sebastes ruberrimus*) and rougheye rockfish (*S. aleutianus*) using baited longlines (hooks) on seamounts, 1989-1993.

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE No.[b]	SEAMOUNT
1992	Aug 3- Aug 10	Storm Dodger	S-SDD-1-17	92049	Bowie
1992	Aug 3-Sep 4	Carribac	S-CRR-1-23	92050	Bowie
1992	Aug 12-Aug 18	Storm Dodger	S-SDD-2-19	92052	Bowie
1992	Aug 18-Sep 3	Storm Dodger	S-SDD-3-20	92056	Bowie
1993	Aug 15-Sep 1	Star	S-STR-1-13	93024	Bowie

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 4. Summary of fishing trips targeting on albacore tuna during travel to/from and between fishing trips for sablefish on seamounts, 1989-1993.

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT
1992	Aug 1-Aug 18	Nopsa	S-NOP-5-18	92047	Cobb Warwick Eickelberg Brown Bear

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 5. Summary of type and number of biological samples collected for rougheye rockfish taken by fishing trips targetting on sablefish using traps on seamounts, 1989-1993 (L/S=length and sex; L/S/A=length, sex, and age; L/S/A/STOM=length, sex, age and stomachs).

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT	TYPE OF SAMPLE:					
						L/S		L/S/A		L/S/A/STOM	
						NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH
1989	Jun 1-Jul 19	Viking Sunrise		89001	Bowie	0	0	0	0	1	50[c,d]
1989	Aug 8-Sep 7	Transpacific No.1		89002	Union	0	0	0	0	1	50[c]
1989	Aug 26-Sep 18	Pacific Titan		89003	Warwick	0	0	0	0	1	50[c]
1990	Jun 3-Jul 4	Jeanna Marie		90001	Union	0	0	1	87	0	0
1991	Apr 8-May 10	La Porsche	S-LAP-1-3	91003	Union	0	0	1	50	0	0
1991	May 3-Jun 4	Viking Sunrise	S-SUN-1-5	91004	Bowie	0	0	1	59	0	0
1991	Jun 6-Jul 5	Lana Janine	S-LNJ-1-6	91005	Bowie	0	0	1	46	0	0
1991	Jul 7-Aug 10	Viking Sunrise	S-SUN-2-22	91021	Bowie	0	0	1	48	0	0
1991	Aug 28-Oct 10	Viking Sunrise	S-SUN-4-50	91046	Bowie	0	0	1	50	0	0
1991	Sep 3-Sep 24	Nopsa	S-NOP-2-47	91047	Union	0	0	1	50	0	0
					Cobb	0	0	1	50	0	0

Appendix Table 5 (Cont'd). Summary of type and number of biological samples collected for rougheye rockfish taken by fishing trips targetting on sablefish using traps on seamounts, 1989-1993 (L/S=length and sex; L/S/A=length, sex, and age; L/S/A/STOM=length, sex, age and stomachs).

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT	TYPE OF SAMPLE:					
						L/S		L/S/A		L/S/A/STOM	
						NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH
1992	Apr 8-May 4	La Porsche	S-LAP-1-1	92003	Bowie	0	0	1	50	0	0
1992	Apr 16-May 6	Viking Star	S-VST-1-2	92004	Union	0	0	1	50	0	0
1992	Apr 24-May 6	Transpacific #1	S-TCP-1-3	92008	Union	0	0	2	100	0	0
1992	May 23-Jun 7	Nopsa	S-NOP-2-9	92016	Warwick	0	0	1	50	0	0
1992	May 28-Jul 2	Star Wars	S-SWR-1-12	92017	Bowie	0	0	2	100	0	0
1992	May 30-Jun 30	Westerly Wind	S-WWN-1-10	92019	Union	0	0	1	32	0	0
1992	Jul 2-Aug 2	Viking Sunrise	S-SUN-1-16	92036	Bowie	0	0	2	90	0	0
1992	Jul 30-Sep 4	Pacific Prowler	S-PPR-1-21	92048	Bowie	0	0	1	50	0	0
1992	Aug 29-Sep 19	Viking Sunrise	S-SUN-2-24	92060	Bowie	0	0	2	105	0	0
1992	Sep 30-Oct 10	Nopsa	S-NOP-6-25	92065	Bowie	0	0	1	50	0	0
1993	Mar 31-Apr 14	Star Wars II	S-SWR-1-04	93004	Bowie	0	0	1	56	0	0
1993	Apr 29-May 29	Westerly Wind	S-WWN-1-09	93007	Bowie	0	0	2	100	0	0

Appendix Table 5 (Cont'd). Summary of type and number of biological samples collected for rougheye rockfish taken by fishing trips targetting on sablefish using traps on seamounts, 1989-1993 (L/S=length and sex; L/S/A=length, sex, and age; L/S/A/STOM=length, sex, age and stomachs).

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT	TYPE OF SAMPLE:					
						L/S		L/S/A		L/S/A/STOM	
						NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH
1993	Jun 3-Jun 20	Star Wars II	S-SWR-2-10	93010	Bowie	0	0	1	57	0	0
					Union	0	0	1	59	0	0
1993	Jul 10-Aug 13	Westerly Wind	S-WWN-2-11	93011	Union	0	0	1	55	0	0
					Warwick	0	0	1	59	0	0
1993	Aug 9-Aug 26	Viking Star	S-VST-1-12	93025	Bowie	0	0	2	100	0	0

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.
[c] Frozen in the round, head on, for Department of Fisheries and Oceans port observers.
[d] Labelled as "Redcod".
[e] Random sample for species identification labelled as "Rockfish".

Appendix Table 6. Summary of type and number of biological samples collected for rougheye rockfish taken during fishing trips targetting on sablefish using baited longlines (hooks) on seamounts, 1989-1993 (L/S=length and sex; L/S/A=length, sex, and age; L/S/A/STOM=length, sex, age and stomachs).

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT	TYPE OF SAMPLE:					
						L/S		L/S/A		L/S/A/STOM	
						NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH
1992	Apr 25-May 18	Nordic Spirit	S-NSP-1-6	92007	Bowie	3	570	1	49	0	0

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 7. Summary of type and number of biological samples collected for shortraker rockfish taken by fishing trips targetting on sablefish using traps on seamounts, 1989-1993 (L/S=length and sex; L/S/A=length, sex, and age; L/S/A/STOM=length, sex, age and stomachs).

YEAR	DATE	VESSEL	TRIP REPORT NO.[a]	FILE NO.[b]	SEAMOUNT	TYPE OF SAMPLE:					
						L/S		L/S/A		L/S/A/STOM	
						NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH	NO. SAMP.	NO. FISH
1990	May 26-Jul 7	Viking Sunrise		90002	Bowie	2	118	0	0	0	0

[a] Trip report numbers were assigned by Archipelago Marine Research, 1991-1993.
[b] File numbers prior to 1991 were assigned by Department of Fisheries & Oceans; file numbers from 1991-1993 were assigned by Archipelago Marine Research.

Appendix Table 8. Summary of differences in CPUE among years and among depths for Bowie, Cobb, Union, and Warwick Seamounts, by order of decreasing means. Years and depths that were significantly different ($P \leq 0.05$) from one another are not underlined; those that were not significantly different are underlined.

Comparison	Seamount	ANOVA	SNK Comparison						
CPUE among years	Bowie	P < 0.001	88	89	87	90	91	92	93
	Cobb	P < 0.001	83	90	89	91	88	92	
	Union	P < 0.001	83	90	89	88	91	93	92
	Warwick	P < 0.001	90	89	92	91	93	88	
CPUE among depths(m)	Bowie	P < 0.001	640-822	457-639	>1188	823-1005	274-456	1006-1188	
	Cobb	P < 0.001	823-1005	640-822	1006-1188	457-639			
	Union	P < 0.419	823-1005	640-822	457-639	1006-1188			
	Warwick	P < 0.224	640-822	823-1005	457-639	1006-1188			

Appendix Table 9. Summary of differences in length for males and females among years for Bowie, Cobb, Union, and Warwick Seamounts, by order of decreasing means. Years that were significantly different ($P \leq 0.05$) from one another are not underlined; those that were not significantly different are underlined.

Sex of fish	Seamount	ANOVA	SNK Comparison							
Males	Bowie	$P < 0.001$	91	92	93	90	85	89	87	88
	Cobb	$P < 0.001$	92	91	89	85	90	83		
	Union	$P < 0.001$	93	91	89	92	90	83	85	88
	Warwick	$P < 0.001$	93	91	90	92	85	89		
Females	Bowie	$P < 0.001$	85	93	92	90	91	87	89	88
	Cobb	$P < 0.001$	85	92	83	91	90	89		
	Union	$P < 0.001$	93	90	92	83	89	85	91	88
	Warwick	$P < 0.065$	91	92	90	93	85	89		